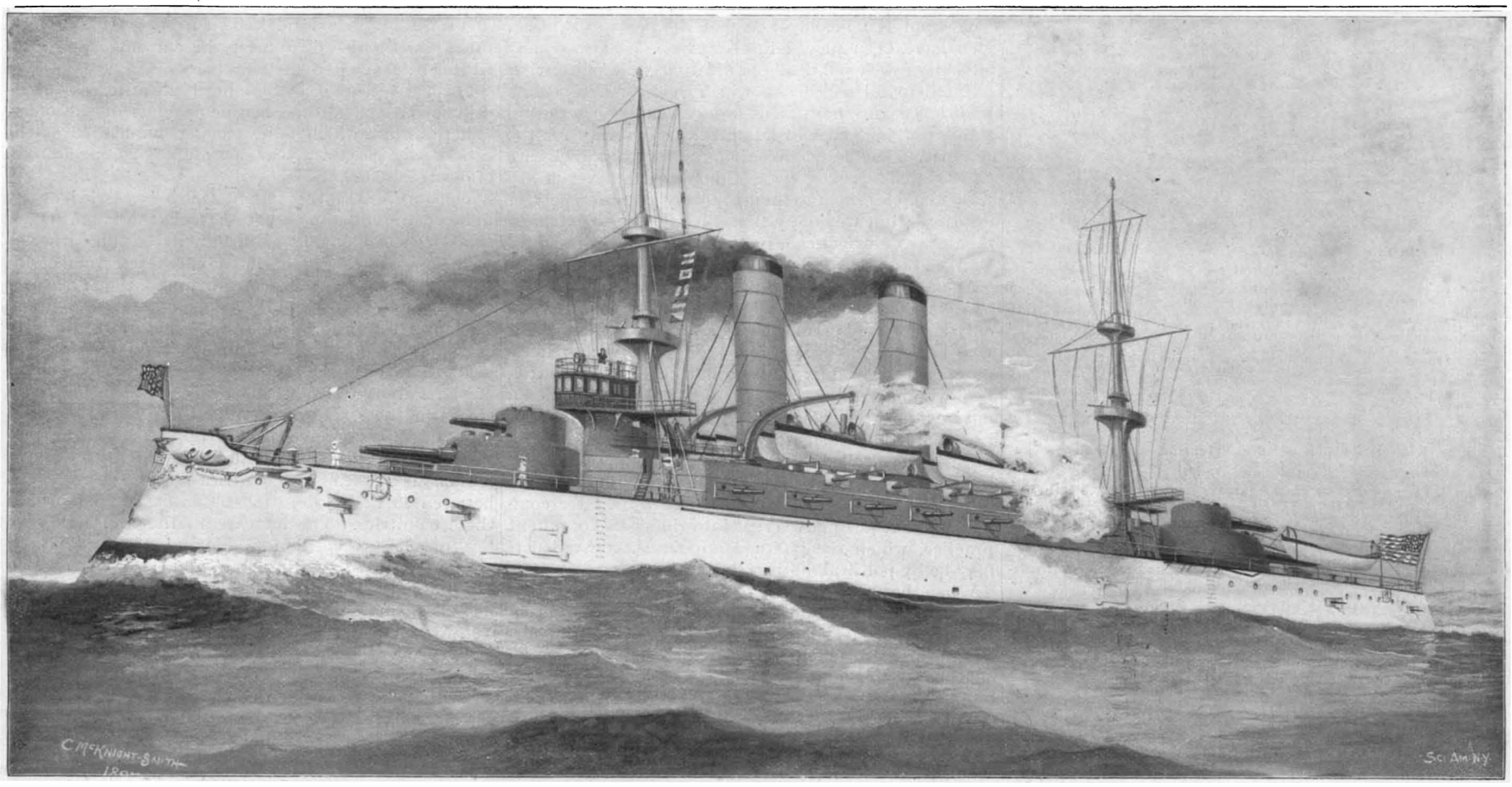
SCIENTIFIC AMERICAN

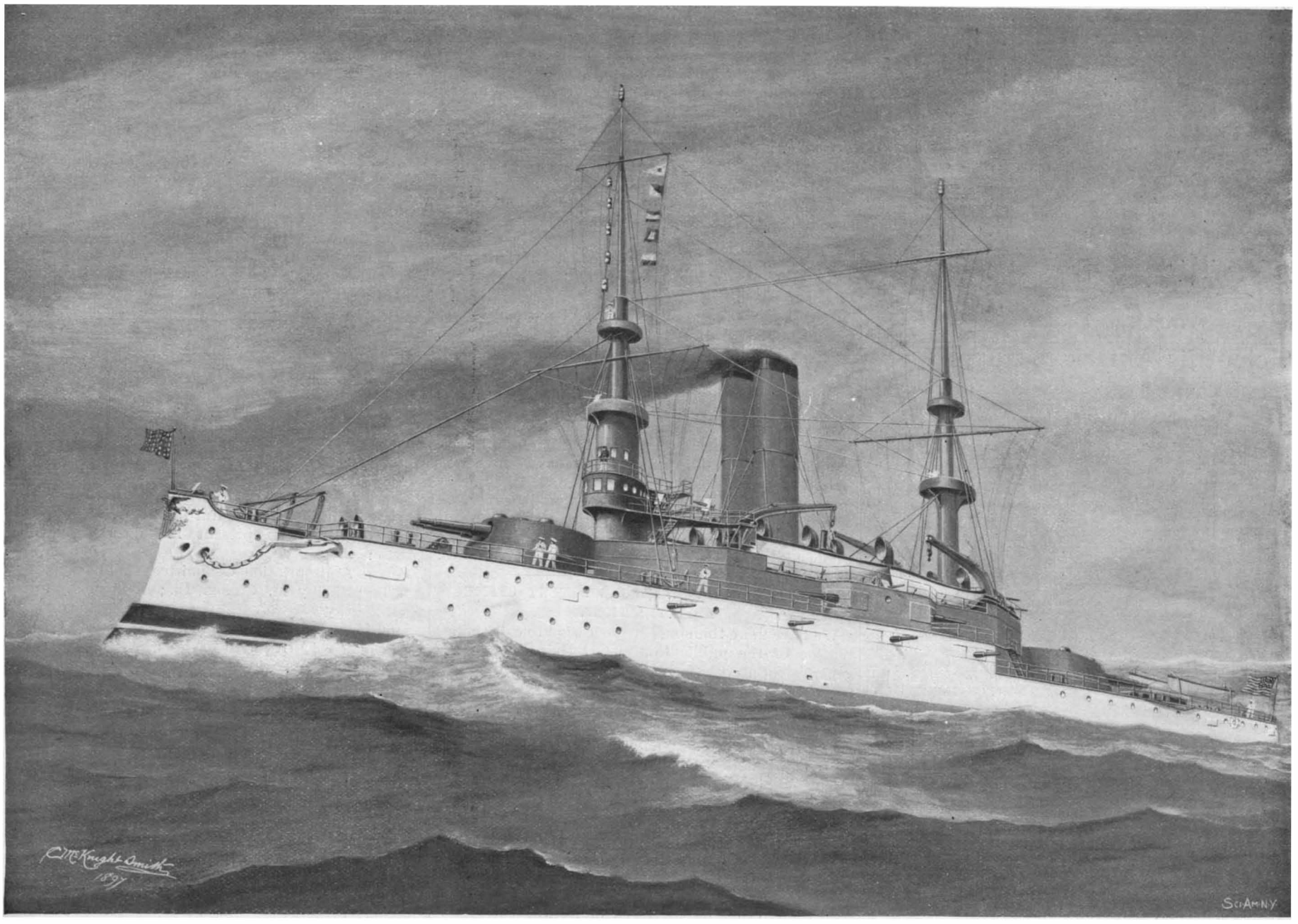
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1898, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXVIII.—No. 5. ESTABLISHED 1845. | NEW YORK, JANUARY 29, 1898. | $3.00 A YEAR. WEEKLY.



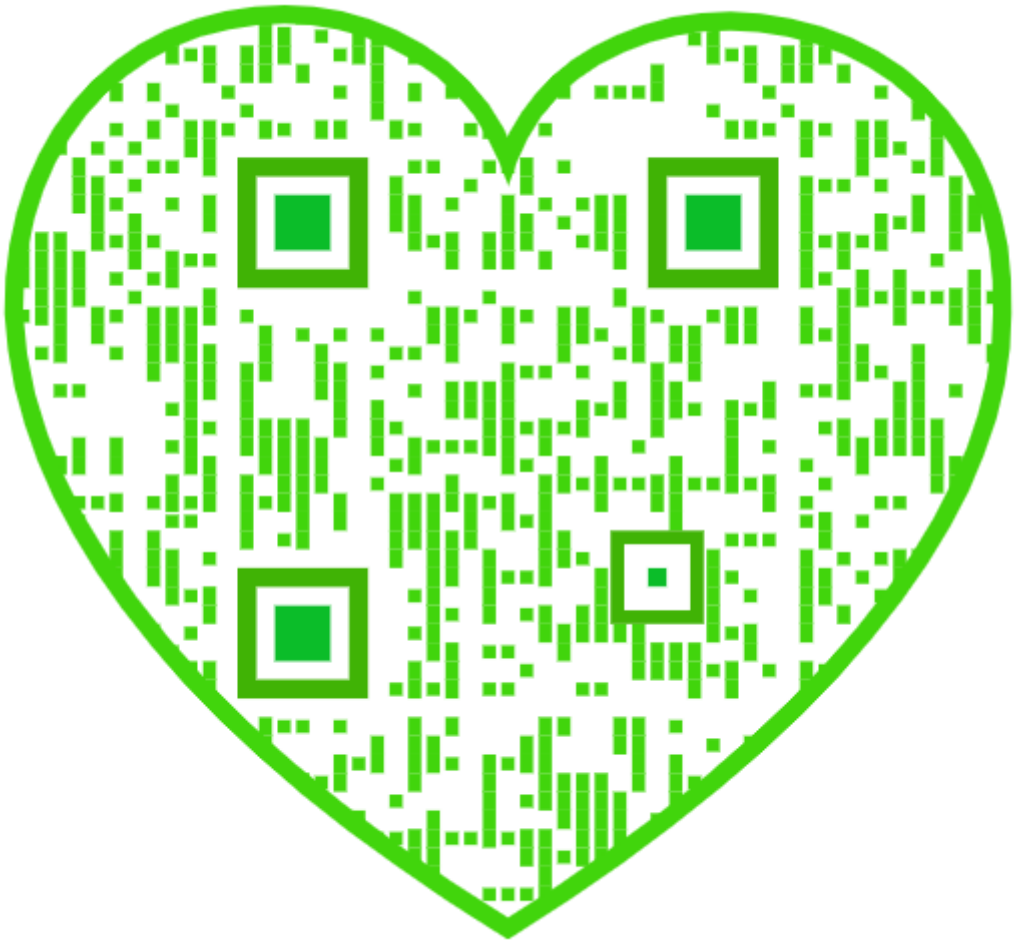
BATTLESHIP "KENTUCKY"—DISPLACEMENT 11,525 TONS, SPEED 16 KNOTS. AUTHORIZED IN 1895.



BATTLESHIP "ALABAMA"—DISPLACEMENT 11,520 TONS, SPEED 16 KNOTS. AUTHORIZED IN 1896.

THE LATEST BATTLESHIPS FOR THE UNITED STATES NAVY.—[See page 69.]

© 1898 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.
(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....**$3.00**
One copy, six months, for the U. S., Canada or Mexico..... **1.50**
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. **4.00**
Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, corner Franklin Street, New York.

The Scientific American Supplement
(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year for the U. S., Canada or Mexico. $6.00 a year, or £1 4s. 8d., to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries, *eight dollars and fifty cents a year*, or £1 14s. 11d., postage prepaid.

Building Edition of Scientific American.
(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders, and all who contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign countries, $3.00 a year, or £0 12s. 4d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign countries, $6.50 a year, or £1 6s. 9d. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, and SUPPLEMENT, $9.00 a year. To foreign countries, $11.00 a year, or £2 5s. 2d., postage prepaid.

Export Edition of the Scientific American
(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, or £0 12s. 4d., postpaid to any part of the world. Single copies, 25 cents.

MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JANUARY 29, 1898.

Contents.

(Illustrated articles are marked with an asterisk.)

Aconcagua, Mount, ascent of.... 76
Alabama, battleship*.... 65
Aluminum, acid resisting.... 70
Archæological news.... 71
Arc lamp, 9,000 candle power*.... 75
Battleships, our new*.... 65
Bazin, M., death of.... 71
Benin, curios from*.... 73
Blacking, waterproof.... 70
Bridge swing, a curious.... 76
Britannic, record of.... 68
Bulkheads, watertight.... 72
Butterworth, death of Mr.*.... 67
Cabinet, Worthington's prescription*.... 68
Catacombs lighted by electricity.. 76
Chimney and pole problem, the.. 71
Commissioner of Patents, appointment.... 66
Crickets, the chirping of.... 68
Cruiser, raising a stranded.... 71
Electric light beacon, a great*.... 75
Electric locomotives for London. 70
Fish, burrowing.... 71
Gasoline motor, a new*.... 68
Hawaiian expedition, Prof. Libbey's.... 74
Inventions recently patented.... 77
Inventors, and Manufacturers' Association.... 67
Kentucky, battleship*.... 65
Lens, 90,000,000 candle power*.... 75
Letters, the safe sealing of.... 75
Linoleum, underlays for.... 70
London fire, the late.... 76
Metals, world's consumption of.. 74
Microscopical examination of growing plants.... 72
Moodus noises, the.... 67
Natural science gift to Yale.... 75
Naval use of homing pigeons*.... 72
Notes and receipts.... 70
Patent Office, business of the.... 76
Patent Office needs.... 66
Patents granted, weeekly record of.... 77
Patent swindlers arrested.... 74
Pigeons, homing, in naval service*.... 72
Plaster casts, making.... 70
Science notes.... 71
Scientific American offices, Washington*.... 70
Seismoscope, an electric.... 75
Sesame oil.... 68
Tibet, Landor's expedition to.... 74
Tire removing device, Robinson's*.... 68
Trade mark law, Bolivian.... 74
Wood oil, Chinese.... 68

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1152.

For the Week Ending January 29, 1898.

Price 10 cents. For sale by all newsdealers.

PAGE

I. BACTERIOLOGY.—Bacteriology in 1897.... 18416
House Flies, Gnats and Mosquitoes as Destroyers of Pathogenetic Microbes.... 18419

II. BICYCLES.—The Pneumatic Tire.... 18408

III. BIOGRAPHY.—Theodor Mommsen, Octogenarian.—A biographical sketch by CHARLES DE KAY of the eminent historian, with a portrait.—1 illustration.... 18405

IV. BOTANY AND HORTICULTURE.—Castanopsis Chrysophylla.—1 illustration.... 18416

V. CHEMISTRY.—Chemistry in 1897.—An excellent review of the chemical progress in the year 1897, referring to researches on argon, liquefaction of fluorine, synthetic remedies, etc.... 18406

VI. ELECTRICITY.—A Review of American Electrical Progress During the Year 1897.—A resume of the interesting and important advances during 1897.... 18417

VII. FISHERIES.—The United States Fish Commission Salinometer.—3 illustrations.... 18417
A Lack of Whalebone.... 18411

VIII. MARINE NAVIGATION.—Lambert's Gliding Boat.—An illustrated description of a curious boat which propels itself by gliding over the waves.—2 illustrations.... 18408

IX. MARINE ENGINEERING.—Auxiliary Engines and Transmission of Power on Naval Vessels.—By GEORGE W. DICKIE.—A valuable paper dealing in a masterly manner with the various methods of transmitting power to various parts of the vessel.—4 illustrations.... 18409

X. MECHANICAL ENGINEERING.—A Large Boring Mill.—1 illustration.... 18409

XI. METALLURGY.—The Use of Aluminum in the Brass Foundry. 18419

XII. MISCELLANEOUS:
Engineering Notes.... 18418
Electrical Notes.... 18418
Selected Formulæ.... 18418

XIII. PHOTOGRAPHY.—Photographic Formulas.—Formulas for pyrogallic acid, hydroquinone and eikonogen developers.... 18407

XIV. TECHNOLOGY.—A Lack of Whalebone.... 18411

XV. TRAVEL AND EXPLORATION.—Story of the Yukon.—Getting into the Yukon.—An exhaustive article, occupying more than four pages of the SUPPLEMENT, written by WILLIAM OGILVIE, F.R.G.S., who is almost the best known authority on the subject.—The paper is filled with valuable memoranda of personal experiences in the Yukon.—7 illustrations.... 18412

THE APPOINTMENT OF A COMMISSIONER OF PATENTS.

The vacancy created by the decease of the late Commissioner of Patents imposes upon the executive the duty of selecting a properly qualified successor to this important office. In the whole range of offices which are filled by government appointment there is none that calls for so many special qualifications as this, and the selection should be made primarily with regard to the administrative and professional ability of the candidate—the question of mere political services and the recommendations of political friends being made strictly subordinate.

The Patent Office has suffered too severely in the past from the incompetence of political appointees. Men have been placed in charge who, whatever may have been their political qualifications, were altogether unfitted to fill a position which calls for a thorough knowledge of the patent system and an unusual amount of judicial and administrative ability for the conduct of its affairs. We do not deny that there are political office seekers possessed of a certain versatility which enables them to fill acceptably a wide variety of positions; but we do say that there are certain offices, the duties of which can, in the very nature of things, be filled only by specially qualified men.

Among these, and perhaps chief among them, is that of Commissioner of Patents; and that its duties can only be properly performed by a professional man, one who has had a thorough acquaintance with patent practice, is proved by the record of the various gentlemen who have filled the position in the past. When a novice has been placed in charge, the results have been far from satisfactory. The attempted improvements and so-called reforms in the laws and working of the office have been fruitless or positively harmful, and have had to be reversed or repealed by a later commissioner. Abuses have crept into the system of patent practice, which the political appointee, controlled it may be by political motives, has failed to eradicate.

When the new commissioner enters upon the duties of his office, he should do so feeling that he is absolutely free from all external controlling influences of a political nature. He should realize that he is given the office because he understands its duties, and is justified by his past training and experience to perform them intelligently. It was this fitness coupled with his undoubted integrity and independence that rendered the appointment of the late commissioner so acceptable, and his administration so successful. One of his very first acts was to rid the patent practice of an abuse which had grown to extraordinary dimensions because of the laxity which in this respect marked the previous administration of the affairs of the office. A patent lawyer himself of long experience, he understood thoroughly the working of the system, and he conducted the affairs of the department with sole reference to its best interests.

It can safely be said that there is no department which, as a rule, has been purer, more free from political intrigue, than this; and it is earnestly to be hoped that, in selecting a successor to Mr. Butterworth, a man will be chosen who, like him, is thoroughly conversant with the workings of the patent system and possesses the necessary judicial qualities for this difficult and responsible position.

It has never been the practice of the SCIENTIFIC AMERICAN to advocate the claims of particular individuals in matters of this kind; but in the present case we feel compelled to state that our past experience of the acting incumbent of the office convinces us that no better man could possibly be selected for the position,

Judge A. P. Greeley has been the practical head of the department during the protracted illness of the late Commissioner, and his management has been characterized by excellent judgment and unusual administrative capacity. His appointment would be received with great satisfaction not only by the department but by the inventors and manufacturers of the country, to whom his name is already well and honorably known.

URGENT NEED FOR LARGER PATENT OFFICE APPROPRIATIONS.

We have more than once had occasion to call the attention of the public to the fact that, unless more generous appropriations are made by Congress for carrying on the business of the Patent Office, its work is certain to fall hopelessly in arrears. The failure of the Patent Office staff to keep pace with the business of the office is not due to any want of capacity or zeal on the part of its examiners and clerical force. It is safe to say that there is no department whose staff is worked so hard—so completely overworked—as this, and that the business of the office is falling behind is to be attributed solely to the fact that the force employed is altogether inadequate.

This fact has long been recognized by the Patent Commissioner, and urgent requests have been made from time to time for increased appropriations to enable the necessary increase in the force to be made. In the report of the late lamented Commissioner of Patents for the year ending June 30, 1897, the subject is referred to as follows: "I desire to call especial attention to the steady increase in the business of this office, and to say that, if the work is not to fall hopelessly in arrears, an increase of force must be provided during the ensuing fiscal year." One would naturally suppose that such urgent representations as these would meet with ready response from Congress; yet, as a matter of fact, the appropriations have been as steadily refused as they have been persistently requested.

Now the gross injustice of the course pursued by Congress will be evident when it is borne in mind that the money which the Patent Office requests is its own money, paid by inventors in the shape of patent fees, and set apart in a fund known as the Patent Office fund, whose object is to meet the current expenses of the office.

For many years past there has been an excess of receipts over expenditures in the business of the office, and the fund, which is now being augmented at the rate of over $300,000 a year, has already reached a total of over $5,000,000.

The business of the Patent Office is carried on by means of annual appropriations from the Patent Office fund. The Commissioner of Patents has no authority whatever over a single dollar of the receipts of his office. He turns every cent over to the Treasurer of the United States and he is dependent entirely upon the annual appropriations of Congress for means to carry on the business of his department. For many years there has been a steady increase in the business of the Patent Office without any commensurate increase in the staff or the annual appropriations. In 1886 the office received 35,968 applications; in 1896 there were 43,982. Up to 1870 the total number of patents issued by foreign countries was 358,000, whereas between 1871 and 1896, 1,282,000 patents were issued in these countries. The increase in the transactions of the office has called for enlarged accommodations and an increased working staff, and the surplus which this bureau has been accumulating would at any time have been more than enough to meet the emergency. Yet, for some unaccountable reason, Congress, though lavish—over lavish—in its appropriations for other purposes, has pursued an extremely parsimonious policy with regard to the Patent Office. This refusal is the more unjust because, as we have pointed out, this Department is merely asking that the surplus of its own earnings may be appropriated to its own needful expenses. The recommendations of the Commissioner for appropriations are passed on by the Patent Committees in the Senate and the House, who almost invariably approve them. They then come before the Appropriation Committee, who failing to see the broad distinction between this appropriation and appropriations say for rivers and harbors, have almost invariably cut them down to a figure much below the growing necessities of the office.

Undoubtedly one great cause of the neglect of the interests of the Patent Office is the total misunderstanding of the real nature of the annual requests of the Commissioner for money. They are not requests for "appropriations" in the common sense of the term. The money asked for does not come out of Uncle Sam's pocket in the way that river and harbor or pension appropriations do. The Commissioner merely requests that a sufficient amount of the earnings of the Patent Office may be placed at his disposal to enable him to transact its business to the best advantage. Whether the amount allowed by the Appropriation Committee be large or small, it will not make the nation's purse lighter or heavier—it will merely be a question of the Patent Office fund lying idle or being applied to its legitimate uses.

If the Appropriation Committee would only judge this matter on its own merits, and not confound it with the extravagant appropriations asked for various public works of doubtful utility, there would be little difficulty in obtaining the needful funds. We believe that the committees at present include the following names:

Senate Appropriation Committee.—William B. Allison, Ia.; Shelby M. Cullom, Ill.; William J. Sewell, N. J.

House Appropriation Committee.—Joseph G. Cannon, Ill.; Henry H. Bingham, Pa.; William W. Grout, Vt.; Stephen A. Northway, O.; William A. Stone, Pa.; Mahlon Pitney, N. J.; James A. Hemenway, Ind.; James J. Belden, N. Y.; Samuel S. Barney, Wis.; William H. Moody, Mass.; Samuel J. Pugh, Ky.; Joseph D. Sayers, Tex.; Alexander M. Dockery, Mo.; Leonidas F. Livingston, Ga.; Thomas C. McRae, Ark.; John M. Allen, Miss.; John C. Bell, Col.

There is no question that the immediate remedy lies with these gentlemen, for it is in the committee that the appropriations have almost invariably suffered their first reduction. We think that the surest way to secure a proper recognition of the rights of inventors would be for the people to bring all possible pressure to bear upon their representatives, both by personal interviews and by written communications.

The cause is a worthy one. An altogether inexcusable injustice is being done to one of the best administered

© 1898 SCIENTIFIC AMERICAN, INC.

and most successful of our institutions. If ever a requested appropriation—if appropriation it can be called—was reasonable and proper, it is this. To refuse it is to deny to the inventors in this country what is justly their own, and deny them the services for which they have paid.

In recommending this matter to the active interest of inventors throughout the whole country, we would remind them that the vexatious delays which they experience in securing their patents are due entirely to the action of Congress in curtailing the appropriations for the Patent Office. Moreover, there is every indication that matters will steadily grow worse if Congress persists in its present policy. We are informed through private sources that it will take the present force of examiners fully three months to examine the cases which came in during the month of December alone. In short, the work is accumulating at a rapid rate and no relief is in sight, as we understand that the Appropriation Committee have already expressed their disinclination to admit any increase of appropriation during the coming year. The matter of agitation for relief rests now largely with the inventors and manufacturers of the country, and if they bestir themselves and write urgent letters to their representatives and to the members of the Committee on Appropriations whose names are given above we believe that the necessary relief may yet be secured.

DEATH OF MR. BUTTERWORTH.

The Hon. Benjamin Butterworth, United States Commissioner of Patents, who has been ill for several weeks at Thomasville, Ga., died on Sunday, January 16, at that place. The end was peaceful and when it came his wife and children were at his bedside. Mr. Butterworth went to Thomasville to recuperate from an attack of pneumonia. He was convalescing when a relapse took place which resulted in his death.

Mr. Butterworth was a descendant of a long line of Quakers. He was born in Warren County, Ohio, 1839, and lived on a farm with his parents until he was eighteen years old, and enjoyed scant educational advantages. In his nineteenth year he went to Cincinnati to fit himself for a professional life. He was admitted to the bar in 1861 and commenced the practice of law in Cincinnati. He enlisted in the Union army in the civil war and rendered gallant service, retiring with the rank of major. He resumed the practice of law in Cincinnati and the first public position which he held was that of United States District Attorney in 1871. He was a member of the Ohio Senate in 1873–74 and was first elected to Congress in 1878. After the retirement of E. M. Marble as Commissioner of Patents in 1883, Mr. Butterworth was appointed in his stead. He served in that capacity until he resigned to become a member of the Forty-ninth Congress. He was afterward elected to the Fiftieth and Fifty-first Congresses and declined the nomination for the Fifty-second Congress. After his retirement from Congress he settled in Washington and soon built up a large practice, chiefly in patent law. He was appointed Commissioner of Patents by President McKinley, April 1, 1897.

While in Congress Mr. Butterworth was admittedly one of the readiest and ablest debaters on the floor of the House, and was always the champion of good government and pure politics. He was president of the commission sent by the United States government to Europe to induce foreign countries to take part in the Chicago World's Fair. During his first tenure of office as a Commissioner of Patents, Mr. Butterworth compiled a most comprehensive work on the "Growth of the Industrial Arts." The work gives the history of two hundred of the arts, from the rude beginnings up to the most complicated examples of modern inventors' skill.

When Mr. Butterworth entered upon his duties as the Commissioner of Patents for the second time, he soon showed that his administration would be liberal minded toward inventors and that those who had been practicing before the Patent Office in an illegitimate manner need expect no mercy from him. He found many abuses to cure, and in his efforts to correct some of them he encountered strong obstacles and made some enemies; but he persisted, and during the last few months of his incumbency he did much to earn the gratitude and respect of the inventors.

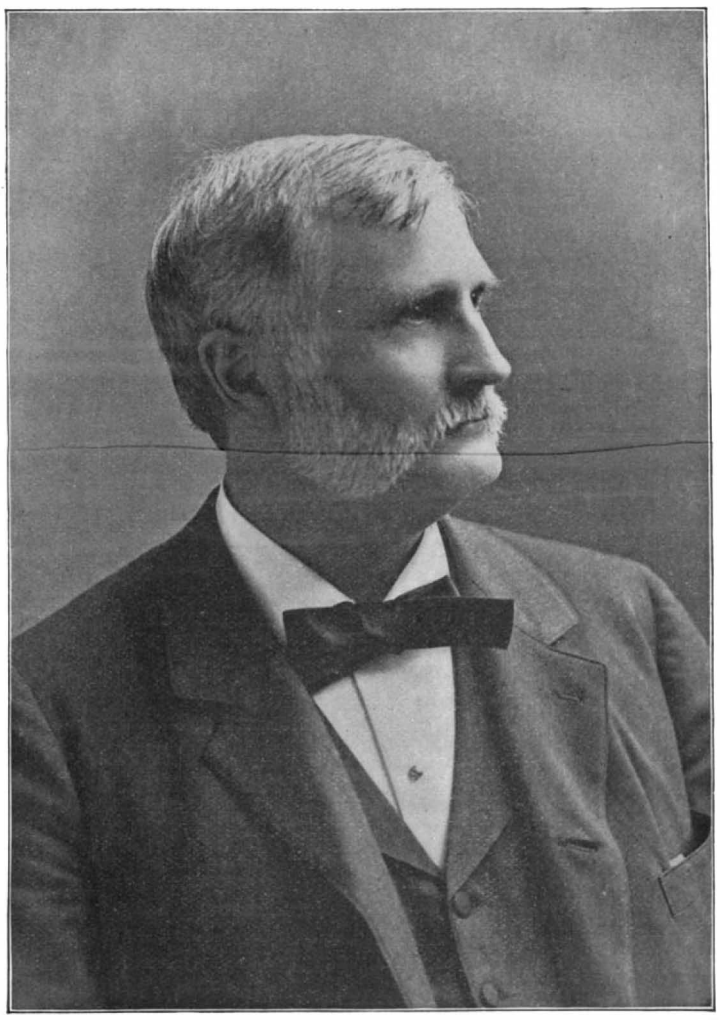
The Secretary of the Interior, in speaking of the death of Commissioner Butterworth, said:

"The death of Commissioner Butterworth is a great loss, not only from a personal aspect, but to the country at large. Everybody loved Butterworth who knew him, and the Interior Department suffers in his loss. Every mark of respect will be paid his memory. The Patent Office will be closed the day of the funeral."

Postmaster-General Gary said: "The death of Major Butterworth will be deplored by the whole country. His was one of the most lovable of natures. He was a kind friend, a loving parent and a thoroughly conscientious man. His face will be missed by the legions of those fortunate enough to have known him, and his place in the party to which he was devoted cannot be filled."

The employés of the Patent Office assembled in the room of the Commissioner on the afternoon of January 17 to participate in a meeting called in honor of the memory of their dead chief. Acting Commissioner Greeley paid an eloquent tribute to Major Butterworth. A committee was appointed to draft suitable resolutions. President McKinley was deeply pained by the death of his old friend, and at the Capitol there was a universal expression of grief.

The funeral services were held in Washington on January 19 and were attended by President McKinley, Vice-President Hobart, Speaker Reed and members of the cabinet, and most of the prominent officials of the different government departments.



THE LATE HON. BENJAMIN BUTTERWORTH.

AMERICAN ASSOCIATION OF INVENTORS AND MANUFACTURERS.

The regular annual meeting of this association was held at the Shoreham Hotel, Washington, D. C., on January 18. The president, Francis H. Richards, of Hartford, Conn., called the meeting to order. Among the important reports received was the one from the legislative committee, read by Mr. Arthur Stewart, which was in effect that the association should concentrate its efforts to have a classification division created in the Patent Office. The object of such a division was to have the patents so classified and arranged that the work of examination to determine the previous state of the art would be facilitated. Suitable resolutions were passed commemorating the death of Commissioner Butterworth and Mr. Gardiner G. Hubbard, the latter being one of the organizers of the association.

The following amendments to the constitution and by-laws were adopted:

The object of this association is to maintain, foster and protect the patent system of the United States, to increase the efficiency of its operation and the stability of patent property.

To accomplish these results the association aims to strengthen public opinion favorable to the patent system, by demonstrating the enormous advantages which have been derived by the people of the United States therefrom, in the increase of manufactures and material wealth which has resulted from new machines and methods produced under the stimulus of the legal protection afforded to inventors by the patent system of the United States.

To procure from Congress legislation authorizing the Patent Office, the only department of the government which pays all of its expenses out of its income, to spend so much of that income as may be necessary for the scientific, thorough and efficient examination of applications for patents, to the end that patents may be granted only for inventions undoubtedly new; and

To strengthen the legal remedies for the protection of such patents as may be issued after a thorough examination.

The association proceeded to ballot for the officers for the ensuing year, with the following results:

President, Francis H. Richards, Hartford, Conn.; first vice president, J. C. Anderson, Chicago, Ill.; second vice president, L. W. Serrell, New York City; third vice president, Philip T. Dodge. New York City; fourth vice president, Theodore N. Ely, Philadelphia; secretary and treasurer, Arthur Stewart, Baltimore; members of the executive council, C. E. Billings, Hartford, Conn.; Dr. R. J. Gatling, New York; Robert S. Taylor, Fort Wayne, Ind.; Albert A. Pope, Boston, Mass.; Daniel Frazer, Washington, D. C.; Marvin C. Stone, Washington, D. C.; Lewis Miller, Akron, Ohio; G. H. Schulte, Milwaukee, Wis.; Jas. T. Du Bois, Washington, D. C.

Committees on Legislation and Ways and Means were appointed.

A resolution was passed recommending the removal of the models in the Patent Office to the National Museum and their careful preservation as relics of the unprecedented progress of science and the useful arts during the past half century. The Secretary of the Interior and the Secretary of the Smithsonian Institution are to be urged to favor this step.

THE MOODUS NOISES.

It is stated that the disturbances of the lower Connecticut Valley, which produce what from early colonial times have been called the "Moodus Noises," have begun again, after a period of rest of twelve years.

For twenty years, up to 1729, the villagers of the town of East Haddam heard these noises almost continuously. The Rev. Mr. Hosmer, in a letter written August 13, 1729, says, in speaking of the phenomenon: "Whether it be fire or air distressed in the subterraneous caverns of the earth cannot be known; for there is no eruption, no explosion perceptible, but by sounds and tremors, which are sometimes very fearful and dreadful. I have myself heard eight or ten sounds successively, and imitating small arms, in the space of five minutes. I have, I suppose, heard several hundreds of them within twenty years; some more, some less terrible. Sometimes we have heard them almost every day, and great numbers of them in the space of a year. Oftentimes I have observed them coming down from the north, imitating slow thunder, until the sound came near or right under, and then there seemed to be a breaking like the noise of a cannon shot or severe thunder, which shakes the houses and all that is in them."

The center from which the noises proceed seems to be Mount Tom, situated at the junction of Moodus and Salmon Rivers. The severest shocks have been felt as far northeast as Boston and as far southwest as New York, and have there been noticed as earthquakes. In 1816 and 1817 these noises were more than usually loud. On the recent recurrence there was a sound resembling a clap of thunder, followed for a couple of hours by a roar like the echoes of a distant cataract. A day later there was heard a crashing sound like that of heavy muffled thunder, and a roar not unlike the wind in a tempest. The ground was so shaken as to cause houses to tremble and crockery to rattle as though an earthquake were in progress.

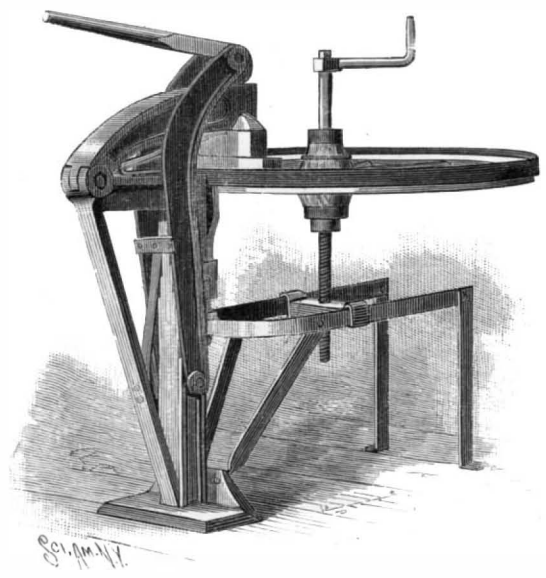
The Indians, familiar with these noises long before the advent of the whites among them, called the region now embraced in the town of East Haddam, and particularly that situated in the vicinity of Mount Tom, Matchemâdoset, or "at the place of bad noises." This name, corrupted and contracted to Machamoodus, and finally to Moodus, gives name to a branch of Salmon River and to a manufacturing village. The region where these subterranean disturbances have occurred from time immemorial is one of deformed crystalline rock.

SIR JOHN LUBBOCK has gone to the ant again, and if he keeps up his visits and others imitate him, that interesting insect will become useless for Sunday school purposes. Sir John succeeded in getting fifty ants helplessly drunk and then placed them outside an ant hill. The sober ants came out, picked up their friends, and put them to bed to sleep off the effects of Sir John's liquor; the strangers, however, they sternly rolled over into the ditch.

© 1898 SCIENTIFIC AMERICAN, INC.

A TIRE REMOVING DEVICE.

To facilitate the removal of tires from vehicle wheels without injuring the felly, and also for use in truing tires, the device shown in the accompanying illustration has been invented and patented by D. D. Robinson, of Niles, Mich. On the inner side of a standard mounted on a suitable base is a bracket, from which are carried out diverging arms supported by legs and braces, a connecting piece on the arms supporting a

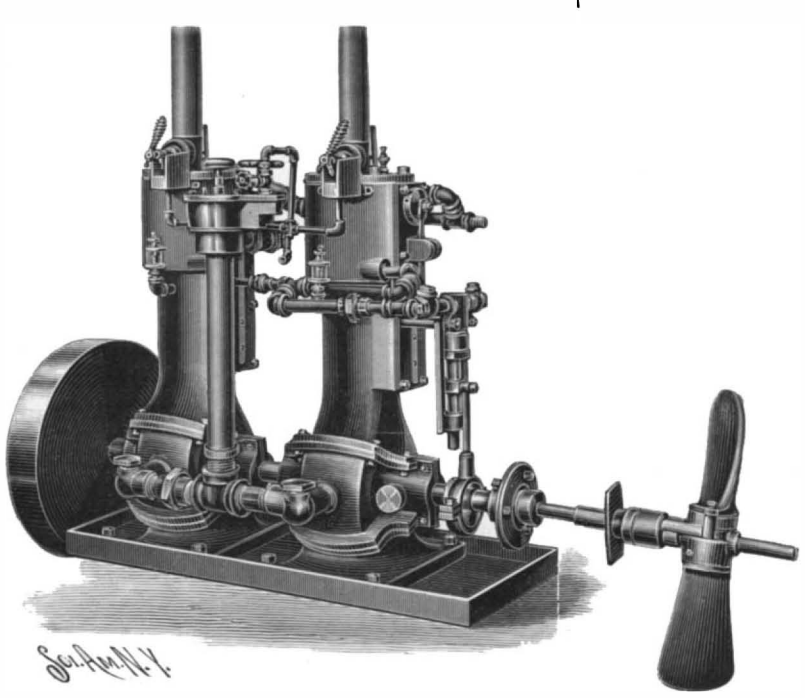


ROBINSON'S TIRE REMOVER.

block with threaded central opening, in which is received the screw-threaded lower end of a vertical shaft, provided above its threaded portion with a collar, on which rests a tapering sleeve adapted to fit into the box of the wheel hub, there being on the upper end of the vertical shaft a crank arm, by turning which the wheel may be raised and lowered by means of the screw on the lower end of the shaft. Extending rearward from the top of the standard is a horizontal arm connected by a brace bar with the bottom of the standard, and pivoted at the rear end of the horizontal arm, and extending beyond the front of the standard, is a curved pressure arm carrying a pressure foot adapted to bear upon the upper face of the felly of the wheel. A spring holds the pressure arm in normal position, with the pressure foot slightly away from the felly. A socket on the inner face of the upright receives the lower end of a dog, whose upper end is adapted to bear on the under side of the wheel tire, a set screw in the upper portion of the standard being adjusted to engage the outer face of the tire. On the sides of the standard are pivoted upwardly and forwardly curved lever arms normally pressed forward by a spring, and in the outer ends of the arms is pivoted a cam or eccentric having an attached handle, by pressing down upon which the cam is caused to engage and force downward the pressure arm with its pressure foot bearing upon the felly, the latter being thus forced downward while the tire is held from movement by the dog. The wheel is gradually turned until the felly has been partially forced from the tire all around, when a block is placed on the felly under the pressure foot and the wheel is lowered by turning the crank, when the operation is continued until the wheel entirely leaves the tire.

A NEW GASOLINE MOTOR.

The accompanying engraving represents a new double cylinder marine gasoline motor built by the Murray Iron Works Company, of Burlington, Iowa. The engine from which the photograph for this cut was taken is of six horse power, with cylinders 4½ inch bore by 5 inch stroke. These motors are built for both stationary and marine purposes; the weight of the marine motors being about 100 pounds to the horse power. The ignition is by incandescent tube. The motors are built on what is known as the two cycle plan, each cylinder giving one impulse at every revolution. The crank shafts are of large size, the throat collars are forged on to the crank shaft, the cranks in the double cylinder motors are set opposite to each other, and the reciprocating parts thoroughly balanced, in consequence of which the vibration is very slight. The propeller is reversible, very strongly made, and a reversing lever gives the operator thorough control of the boat, it not being necessary to stop the motor to stop or back the boat. There are very few reciprocating parts in this motor, in consequence of which it can be run at a high speed. An exhaust muffler is furnished with each engine, making the exhaust almost noiseless. There are a number of these motors in successful operation on the Mississippi and Illinois Rivers.



A NEW DOUBLE CYLINDER MARINE GASOLINE MOTOR.

Uses of Chinese Wood Oil in the Manufacture of Paints and Varnishes.

The Chinese wood oil, tung oil or varnish tree oil (not to be confounded with Gurjun balsam, which is also called wood oil), has of late become an article of commerce, there being two varieties, the Canton oil and the Hankow oil. Although the prices are still too high to admit of competition with linseed oil, the wood oil has gained an entrance into the manufacture of lacquers, varnishes and paints, on account of its particular and salient quality to dry throughout in a very short time under the action of light and air, and there can be no doubt that a large number of other uses will be found, as soon as closer experiments are made with it. Thus Chinese wood oil is already employed as floor oil owing to its hardness, and in the manufacture of waterproof materials it has been used for a product similar to oilcloth, which excels the latter by its extraordinary elasticity.

It cannot be very well employed in a raw state, for the reason that it dries opaque, probably in consequence of the presence of mucilage and albumen. In order to be employed in the same manner as linseed oil, the oil must be boiled with the addition of a few per centum of lead oxides (minium or litharge), for without this addition it always remains opaque. It is true this would be immaterial with the use for paints, but it is necessary even for the purpose of obtaining a greater drying capacity. In boiling the oil proper, whether with lead or manganic compounds, a temperature below 200° C. must be maintained, otherwise, especially in the case of manganic compounds (borate of manganese), a thickening ensues which is followed in a short time by complete gelatination, thus rendering the product unfit for further use. Therefore, the oil should be heated only to 160° or at most 180° C. Then the kettle is taken from the fire or the fuel removed and the siccatives stirred in. This is sufficient to impart to the oil the higher drying capacity desired and to obviate the above mentioned drawback. Pigments, ground in the oil thus prepared, furnish excellent paints, which harden quickly throughout. They do not dry superficially and do not remain soft and sticky below the surface for a long time, like the pigments prepared with linseed oil. Coatings which dry throughout are very much in demand, and for these the higher cost will be no consideration.

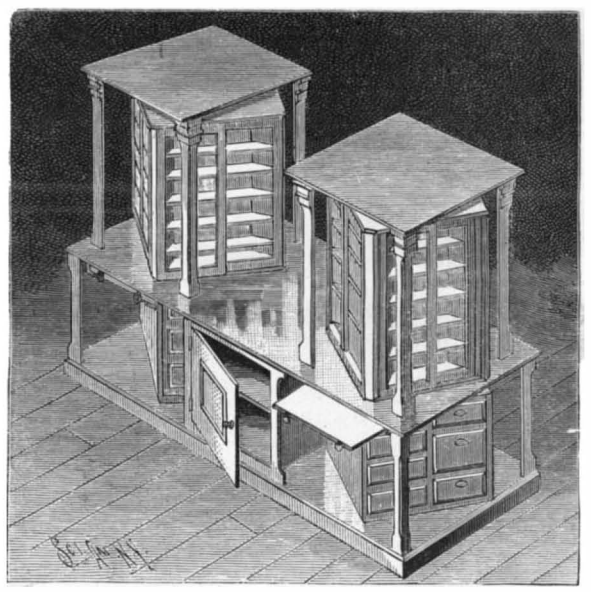
This most important property also renders the wood oil useful in the manufacture of fatty lacquers, while it cannot supplant the oils used for spirit lacquers, because it is absolutely insoluble in alcohol. But attention has to be paid, in using it for the manufacture of fat lacquers, to the fact that the oil will thicken and even gelatinate, together with lead or manganic oxides, at a temperature of 200° C. or close thereto, and that mode of manufacture must be employed with which the completely melted and cooled copal is dissolved in the hot oil, but at a temperature below 160° C. Then boiling with driers can also be done without fear of gelatination. A composition of wood oil and linseed oil will likewise furnish very good results, being especially adapted for the production of exterior varnishes, which receive hardness from the former and elasticity from the latter.

The odor of the Chinese wood oil is a very peculiar one and adheres to the dry coating made with it; it adheres so strongly that it is plainly noticeable even after oilcloth-like goods dried in hot air have been lying for months, the same as oilcloth will always, even after years, smell of linseed oil. Naturally, this peculiar lard-like odor also shows itself with the lacquers produced with the oil, and it therefore becomes necessary to remove it as far as possible or at least to reduce it to a minimum. Disguising the smell by a volatile oil would hardly answer the purpose, because it would reappear after evaporation of the latter. Therefore, other remedies must be resorted to. Among them are: Agitation with a diluted solution of permanganate of potassium; a filtered solution of chloride of lime; filtration through animal charcoal; mixing with flour, potato flour, and storing for a long time after filtration; according to the process of Bang and Ruffin, it is said to be possible to obtain a tolerable freedom from smell by dried amtospheric air. The oil is heated in a suitable kettle and air is passed through the same by means of a ventilator or a blower, at a temperature of 50° C., which must not be exceeded. This is done for 6 to 8 hours; after that the oil has lost perceptibly in odor and can be used for lacquers without hesitation.

We would not omit to observe that the wood oil must not be regarded as a substitute for linseed oil, but that varnishes, paints and lacquers with distinct characteristics can be prepared with it. For this reason it does not seem necessary to attach much value to the deodorization, as the peculiar odor, which is not unpleasant, might serve as a characteristic of the new products.—Translated from the Färben Zeitung.

PRESCRIPTION CABINET FOR DRUGGISTS, ETC.

The accompanying illustration represents an improved cabinet designed for use in drug stores, hospitals, dispensaries, chemical laboratories, etc., effecting economy in time, space, labor and material. It has been patented by Dr. J. M. Worthington, of Annapolis, Md. It is designed that the medicines shall be so arranged that those given in large doses will be held by large bottles in the bottom portion of the cabinet, while the powerful and dangerous medicines will occupy the smaller upper compartments. Owing to the simple arrangement of revolving drawers and



WORTHINGTON'S PRESCRIPTION CABINET.

shelves, different attendants may work at the same cabinet without inconveniencing each other.

The "Britannic's" Wonderful Record.

The White Star steamship "Britannic," which has just reached New York from Queenstown, completed on her last eastward trip her five hundredth voyage across the Atlantic. She is twenty-four years old and, without a renewal of engines and boilers, she has covered more than 1,500,000 nautical miles, consumed 513,000 tons of coal and has carried 57,400 cabin passengers and 165,500 steerage passengers. It is a curious thing that the "Britannic" is a faster ship to-day than she was in what might be called the prime of an ordinary single screw liner.

THE addition of sesame oil to margarine, which has been made obligatory in Germany, gives rise to expectations of a great increase of the consumption of sesame. The export of this not unimportant article from German East Africa had considerably decreased during the last years (1894, 192,000 marks; 1895, 163,000 marks; 1896, 89,000 marks). The Togo district is also said to be well suited for sesame culture, a small export having already taken place. The price of East African sesame in Hamburg is about 210 to 240 marks at the present time.—Chemische Revue.

WHEN a large number of crickets are chirping at night in a field, they do so synchronously, keeping time as if led by the wand of a conductor. Prof. A. E. Dolbear says, in The American Naturalist, that the rate of chirp seems to be entirely determined by the temperature, and this to such a degree that the temperature can be estimated when the number of chirps per minute is known. At a temperature of 60° F. the rate was found to be 80 per minute and at 70° F. it was 120 a minute; this gives a change of four chirps per minute for each change of one degree.

© 1898 SCIENTIFIC AMERICAN, INC.

THE LATEST BATTLESHIPS FOR THE UNITED STATES NAVY.

The latest report furnished to Chief Constructor Hichborn, showing the progress whch is being made in the construction of the five battleships which are building in private yards for the United States navy, shows that the "Kearsarge" and "Kentucky" are more than half completed, and that from 32 to 39 per cent of the work has been accomplished on the "Alabama," "Illinois" and "Wisconsin."

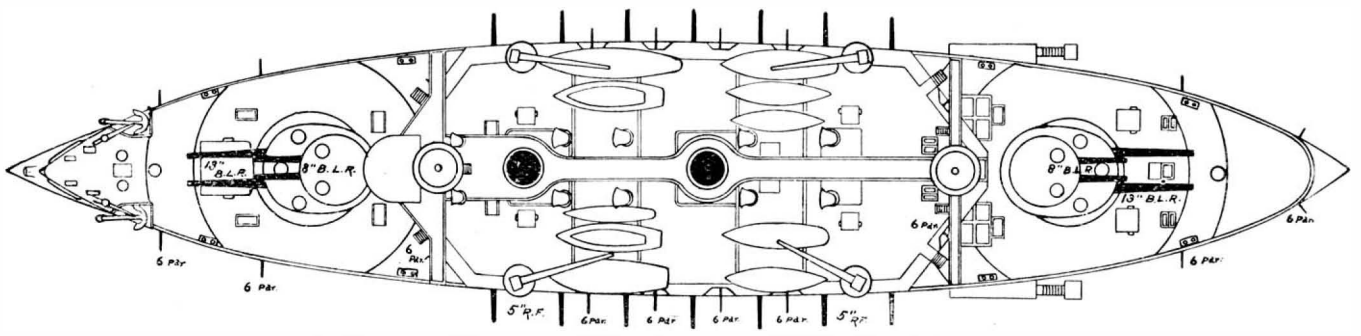
These five vessels, all of which will be first-class, seagoing battleships, belong to two different types, the first of which, authorized in the year 1895, includes two twin ships, the "Kearsarge" and the "Kentucky," which are building at Newport News; the other type, authorized in the following year, consists of the "Alabama," building at the Cramps' yard, the "Illinois," at Newport News, and the "Wisconsin," which is being constructed at the Union Iron Works, San Francisco.

On our front page will be found excellent engravings of two of these ships, representing the two designs, from which it will be seen that they differ considerably from each other and from the class of ships which preceded them, represented by the "Indiana," "Massachusetts" and "Oregon." They represent the advance which has taken place in battleship design since the year 1890, when the "Indiana" class was authorized, and in the "Alabama" we have embodied those features of high freeboard, widely separated main battery and broadside secondary battery of rapid fire guns which are likely to remain permanent in the navies of the world.

The leading features of the two ships are as follows:

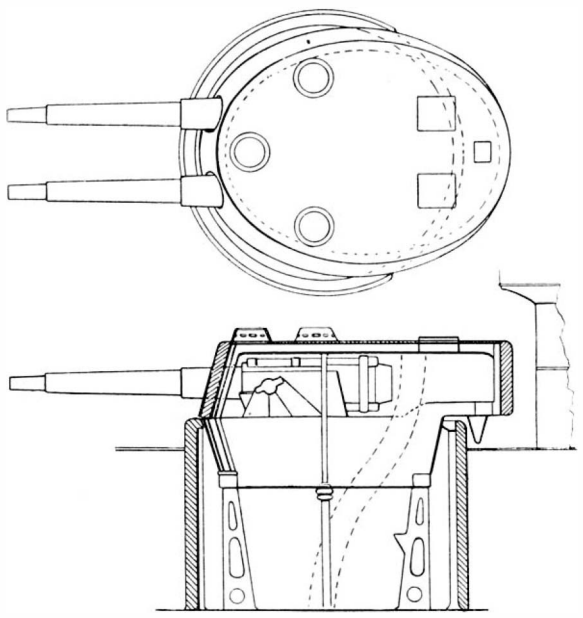
	"Kentucky."	"Alabama."
Waterline length	368 ft.	368 ft.
Beam	72 " 2½ in.	72 " 2½ in.
Draught	23 " 6 "	23 " 6 "
Freeboard forward	14 " 3 "	20 "
" aft	13 " 3 "	13 " 3 "
Displacement	11,525 tons	11,520 tons
Speed	16 knots	16 knots
Coal supply	410 tons	800 tons
Horse power	10,000	10,000
Armor, nickel steel.		
Waterline belt	16½ in.	16½ in.
Side armor above belt	6 "	5½ "
Turret armor	17 and 15 "	17 and 15 "
Barbette armor	15 "	15 " 10 "
Conning tower	10 "	10 "
Protective deck	2¾ "	2¾ to 4 "
Armament:		
Main battery	4 13-in. guns	4 13 in guns.
Submain battery	4 8-in. guns	
Secondary battery	14 5-in. R. F. guns 20 6-p'nd'r R. F. guns	14 6 in. R. F. guns. 17 6-p'nd'r R. F. guns 6 1 " " "

If it is compared with the "Indiana," it will be evident that the greatest change in the "Kentucky" is in the novel method adopted for carrying the 8 inch guns. In the "Indiana" there were eight of these disposed in four turrets, at the four corners of the central armored battery. By this arrange ment it was hoped to be able to train four guns on either beam or directly ahead. In the gunnery trials, however, it was found that if these guns were fired direct ahead or astern, their blast rendered the sighting-hoods of the 13-inch guns untenable. To prevent this "interference," as it is called, the double-deck turrets shown in the engraving were adopted. They constitute the most striking feature in these ships; nothing like it has ever been attempted before and it is not likely that it ever will be again. As far as the danger of interference is concerned, the device is likely to prove a success. The muzzles of the 8-inch guns project well beyond the sighting-hoods of the 13-inch gun turret below it, and no serious effects will probably be felt by the man stationed within them. It will be noticed, moreover, that the "Kentucky" will be able to bring the same number of 8-inch guns to bear in any direction as the "Indiana," that is, two ahead or astern, and four on either beam; in fact, owing to the inability of the 8-inch guns of the "Indiana," to be fired dead ahead or dead astern, the four 8-inch guns of the "Kentucky" may be said to be more efficient than the eight similar guns on the "Indiana." The great weight of two turrets and four guns with their ammunition is thus saved and can be put to other uses.



DECK PLAN OF THE UNITED STATES BATTLESHIP "KENTUCKY."

DECK PLAN AND SIDE ELEVATION OF THE UNITED STATES BATTLESHIP "ALABAMA."



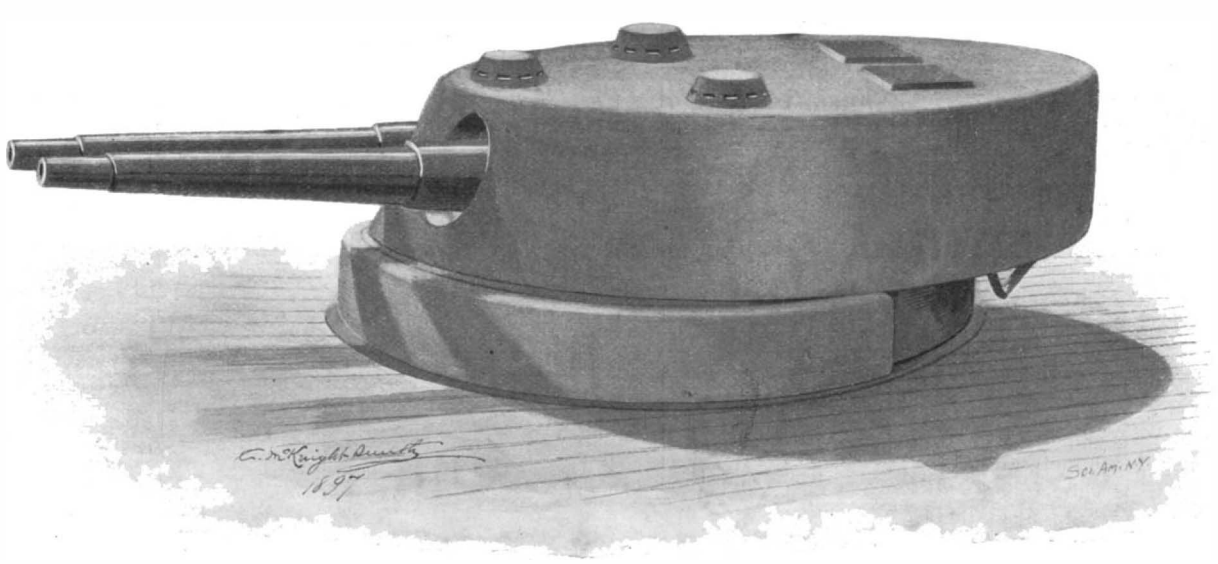
PLAN AND VERTICAL SECTION THROUGH ELLIPTICAL TURRET.

We have said that it is not likely that any more double-deck turrets will be built. The reason for this is the objection which naval designers feel to putting "too many eggs into one basket." It is an accepted axiom in warship design that the various gun stations of a ship should be as widely separated as possible, with a view to localizing the damage inflicted by a successful shot.

If the lower half of a double-deck turret should be crippled, the upper turret would also be placed hors de combat, and a light shell which was incapable of penetrating the 15-inch armor of the lower turret might pass through the 9-inch armor of the upper turret and wreck the turning gear below, thereby disabling the four guns. There is a further objection urged by the gunners in the fact that the two sets of guns must be trained together, whereas it might frequently be desirable in the course of a fight to train the 13-inch guns upon one part of the enemy and the lighter guns upon some other part. The whole question, however, was well thrashed out by the experts at the time the ships were designed, and it was considered that the economy in weight and machinery more than offset the objections which were raised against the system.

Next to the turrets the most novel feature in these ships is the powerful broadside battery of fourteen 5-inch rapid-fire guns which it has been possible to substitute for the four 8-inch guns and turrets and the four slow-firing 6-inch guns of the "Indiana." This battery is shown in the engravings ranged within a central battery on the main deck between the two turrets. There are seven guns on each broadside, each gun firing through an arc of 90 degrees. Though the shell for the 5-inch gun weighs only 50 pounds as against 250 pounds for the shell of the 8-inch gun, so great is the rapidity of fire from the former gun, that three times the weight of metal will be thrown in a given time from the rapid-fire battery. The gunners will be protected by 6 inches of harveyized steel.

On the deck above will be another battery of twelve 6-pounder guns, and eight others will be located forward and aft on the berth deck. It will be the work of these guns to repel the attack of the torpedo boats. A number of 1-pounders and Gatlings will be carried in the tops of the military masts for the purpose of sweeping the decks and other exposed



ELLIPTICAL TURRET OF THE UNITED STATES BATTLESHIP "ALABAMA."

© 1898 SCIENTIFIC AMERICAN, INC.

portions of an enemy. The ship will also carry five discharges for the Whitehead torpedo. The full complement will consist of 40 officers and 480 men.

Turning now to the "Alabama," we notice a further departure from the "Indiana" and a further development along the lines followed in the "Kentucky." The 8-inch gun has disappeared altogether, and the weight and power of the secondary battery has been greatly increased. Moreover, the seagoing qualities as compared with the former ships have been improved by adding another deck for the first three-quarters of the ship's length, thereby increasing the freeboard from 13 feet in the "Kentucky" to 20 feet in the "Alabama." The main battery is the same and consists of four 13-inch guns, which fire an 1,100-pound shell with a muzzle energy of 33,627 foot-tons, equal to the perforation of 34½ inches of wrought iron. The forward pair are carried above the upper deck at an elevation of 26½ feet above the water line. At this great height they could be fought in any weather, even when going head on to a heavy sea, which is probably more than can be said for the forward guns of ships with a freeboard some seven or eight feet lower.

The upper deck extends as far as the after end of the central battery. The after turret is carried above the main deck, or some 7 or 8 feet lower than the forward turret, thereby increasing the stability of the ship. The turrets are of what is known as the elliptical type. They are oval in plan, with the front plates slightly inclined and the rear plates vertical. This form is adopted as being lighter and giving more room for the handling of the guns and their loading appliances. In the old form of circular turret there was more room than was necessary at the sides and too little at the rear of the guns. The diameter of the stationary barbette is made somewhat larger than the shorter axis of the turret, and the center of gravity of the revolving parts is in the axis of rotation; so that the turret, in spite of its considerable overhang at the rear, is balanced and can be turned by its engine without serious retardation, even when the ship has a heavy list. Of the three sighting hoods, the center one is for the man who turns the turret, whose sole work it is to keep the guns always upon the target, as far as their lateral direction is concerned. The hoods on each side are occupied by the "gun pointers," who give the gun the proper elevation or depression.

The removal of the 8-inch guns and turrets has enabled the strength of the secondary battery to be enormously increased, the fourteen 5-inch guns of the "Kentucky" giving place to a battery of fourteen 6-inch guns in the "Alabama." These fire a 100-pound shell, as against the 50-pound shell used by the smaller gun, and their rapidity of fire is only slightly less. Each of these guns will have a muzzle energy of 3,204 tons and will be capable of penetrating 15·6 inches of iron. In addition to its greater weight, the battery will be superior to that of the "Kentucky," because its guns are more widely separated and the protection afforded to the gunners is more complete. Eight of the guns will be inclosed within a central battery on the main deck, whose protection will consist of a continuous wall of 5½ inches of steel. Forward in the bows on the same deck will be two more 6-inch guns, similarly protected, and four other 6-inch guns, two on each side, will be mounted on the upper deck above this casement. They will also be protected with 6 inches of steel, and they will be capable of firing dead ahead and dead astern as well as on the broadside. The combined energy of the 6-inch battery alone will amount to about 225,000 foot-tons per minute—sufficient, when imparted to bursting shells, to tear the unprotected and lightly protected parts of an enemy's ship to pieces, and quickly turn the gun positions into a mere shambles. To these is added a battery of seventeen 6-pounders and six 1-pounders. There are also four broadside torpedo tubes protected with 6 inches of steel armor.

A feature which is a novelty in our navy, though it has been used in many of the later ships abroad, is the placing of the smokestacks abreast of each other instead of on the axis of the ship.

In concluding our notice of these fine ships, it should be pointed out that they maintain the reputation of our naval constructors at the high level at which it was placed by the appearance of the plans of the "Indiana" type some eight years ago. Like them, they carry heavier armor and heavier guns for a given displacement and speed than any ships in the world.

This is best shown by a comparison with the "Majestic" of the British navy. The "Majestic" has a displacement, loaded, of about 15,000 tons to about 11,500 tons for the "Alabama." In spite of this disparity, the "Alabama" carries four 13-inch guns, as against four 12-inch for the "Majestic;" she has fourteen 6-inch rapid-fire guns, as against twelve; she is protected with 16½ inches of side armor, as against 15 inches (9 inches side armor, 4 inches on slopes of deck); she has 17-inch turret armor, as against 6-inch, and her speed is only 1½ knots less. To this is to be added the fact that, being a smaller ship, she presents a smaller target to the enemy, and that, drawing 4 feet less water, she can navigate harbors and rivers and canals into which her bulky antagonist dare not enter. Nothing could bear such eloquent testimony to the excellence of the ships turned out by Chief Constructor Hichborn as is given by the above comparison.

Electric Locomotives for London.

The General Electric Company, of Schenectady, N. Y., has just received an order for thirty-two electric locomotives for the Central London Underground Railway. When this company, some time ago, received the order for the electric apparatus for the road it was generally understood that the locomotives would be built in England, so that this order was somewhat of a surprise. The locomotives will weigh forty-five tons and will have a capacity of 800 horse power; they will be able to draw a train of five cars, weighing 150 tons, fifteen miles per hour. The same company is also preparing plans for the largest railway generator in the world. It will be of 4,000 horse power and will weigh 87 tons. It is to be built for the Louisville Street Railroad Company.

NEW SCIENTIFIC AMERICAN OFFICES IN WASHINGTON, D. C.

We take pleasure in presenting to our friends and readers an illustration of our new office building in Washington, D. C.

We have just transferred our effects from the Pacific Building, where they have been for so many years, to this new building directly opposite, which has been especially fitted up for our own use. This building has been provided with every modern improvement and is

NEW SCIENTIFIC AMERICAN BUILDING IN WASHINGTON.

in all respects equipped for the needs of our extensive business. Any of our friends who may be visiting Washington will be accorded a cordial welcome by our manager.

The new building is located at 625 F Street, and is only a few steps from the Patent Office. We have had our own office in Washington for nearly half a century, but this is the first time we have had quarters that were exclusively our own, and we feel sure that our readers will sympathize with any feeling of pride which we may have in owning such a commodious and attractive building.

We take the liberty of making this brief statement, which must take the place of any formal housewarming.

The Current Supplement.

The SCIENTIFIC AMERICAN SUPPLEMENT for the present week, Number 1152, contains an interesting biographical sketch with portrait of Theodor Mommsen, the historian. "Auxiliary Engines and Transmission of Power on Naval Vessels" is a timely article by Mr. G. W. Dickie. "The Story of the Yukon," by Mr. William Ogilvie, F.R.G.S., occupies four pages and is one of the most reliable and entertaining studies of the Klondike region which has been published. It is a mine of valuable information and is well illustrated. Excellent articles on the progress of chemistry, bacteriology, and electricity in 1897 give a timely résumé of progress during the past year.

PROF. HANSEN, of Dakota, has about concluded his mission to Turkestan for the purpose of securing the seeds and plants best calculated to reclaim sandy wastes. He has secured a good collection.

Miscellaneous Notes and Receipts.

Acid-resisting Aluminum.—While aluminum is known to be easily attacked by alkalies, even strong acids do not injure it in the least. It behaves almost as indifferently as platinum. Aluminum may be left to the strongest nitric acid for days without any effect being visible. This property makes aluminum very valuable for certain purposes. The writer uses aluminum hooks to take out photographic plates from the acid trays. No other material is capable of withstanding the action of the rather strong nitric acid used for acidifying the plates, for any length of time; even hard rubber hooks were corroded in a comparatively short time. The aluminum hooks were found to be invaluable and have the advantage of infrangibility over glass hooks. For acid funnels aluminum may also be employed to advantage.—Technische Mittheilungen.

Making Plaster Casts of Carved Articles.—If the objects are cut conically, they are simply pressed into a lump of soft clay; then paint the mould thus produced with linseed oil, and pour in the plaster of Paris. For complicated objects such as animal heads, deepened reliefs etc., glue moulds are employed. Prepare a box just large enough to receive the model. Boil good joiner's glue in sufficient quantity, and after the model (which has been thoroughly coated with shellac, and after this is dry with linseed oil) has been laid in the box, pour the liquid glue into the box. After a few hours the glue is sufficiently dry so that the model can be taken out. Now coat the glue mould all over with linseed oil and pour in the gypsum. In this manner very good impressions are obtained at a comparatively slight expense. The moulding glue can be used over again at any time.

Waterproof Blacking.—Melt 18 parts beeswax with 1 part borax and stir until a sort of jelly has formed. In another vessel melt 6 parts spermaceti, add 5 parts asphalt varnish which was previously mixed with 66 parts oil of turpentine, stir the mixture thoroughly and finally add the mass to the wax. For color add 5 parts vine black and 2 parts Berlin blue previously ground in a little of the mass. Lastly perfume the grease with 1 part of nitrobenzole and fill in boxes. A little of this blacking is sufficient for use; rub it out with a rag and then brush. A weekly application is sufficient.

Underlays for Linoleum.—The question whether on cement floors a cement or gypsum plaster would be preferable as an underlay for linoleum was answered as follows in the Nordd. Bangew. Ztg.:

It is not advisable to provide cement concrete floors with cement plastering, because the latter allows the moisture that is still contained in the cement to pass through, which remains between the solid floor and the linoleum and cannot escape, as the linoleum is air and water proof. The solid cement floors generally contain still more or less moisture when the linoleum is to be laid, as it is a fact that cement attracts moisture in damp weather and gives it off when the air is dry. Furthermore, cement is a cold underlay. The disadvantages of linoleum lying on a damp underlay are not slight. Mould ensues, which causes unpleasant odors and gradually has a destructive effect on the linoleum, although the back is waterproof. These difficulties are obviated if a plastering of gypsum is used instead of the cement. The gypsum attracts the moisture contained in the concrete without giving it off again, and furnishes a beautiful, smooth, dry and warm flooring. In order to obtain a good gypsum wash floor, the concrete floors are only leveled, without being smoothed. If all the work in the different rooms is finished, so that only the laying of the linoleum remains, the concrete floors are made even with a thin layer of gypsum: then they are dried sufficiently and finally covered with linoleum. A padding of pasteboard is now frequently employed. The same serves for the purpose of dampening the sound and for warmth, as well as for a protection against a wearing off of the pattern. But in no case is it advisable to use this padding on cement plaster floors. One should be sure, before laying the linoleum, that the pasteboard is completely dry. Besides, the edges of the linoleum must fit together so exactly that scouring water cannot get through. The same possibility must be excluded along the skirting boards, as other disadvantages may ensue. It is furthermore advisable to provide the skirting boards with a groove or to fix them the thickness of the linoleum higher on the wall, whereby the laying of the linoleum is facilitated. It is also well to wipe the linoleum after it is laid, but before use, once or twice a week with clear cold water. During or after the wiping the windows should be opened. It cannot be recommended to rub the linoleum with oil. The oil applied to the surface would combine with the dirt and soon give a black, dirty surface to the covering. Waxing is also valueless. It is absolutely disadvantageous to paste the linoleum down entirely, as it is better in every way if it lies loose; the paste is saved and any small repairs that may arise will not necessitate the destruction of the whole covering. As regards the conservation of linoleum when stored, it must be observed that the dirt must be first removed before the linoleum is rubbed with oil and the latter must be spread apart well.

© 1898 SCIENTIFIC AMERICAN, INC.

Correspondence.

Fish Burrowing.

To the Editor of the SCIENTIFIC AMERICAN:

In Science Notes of January 8, 1898, I noticed an account of bass burrowing into the mud for the purpose of hibernating. A case of the German carp burrowing in the mud has come under my notice. Previous to the draining of one of my father's ponds many large carp were seen swimming around, but after draining the pond only a few were seen lying about. After some investigation the remaining ones were found in burrows which they dug in the mud. This pond was drained several times during the summer, and from this fact it would seem probable that the fish took this means of concealment during the operation.

Swarthmore College, Pa. WILLIAM M. MAULE.

The Pole and Chimney Problem.

To the Editor of the SCIENTIFIC AMERICAN:

I wish to call attention to a point in your reply to Notes and Queries, No. 7,293, in the January 8 issue of the SCIENTIFIC AMERICAN. The method of solution is correct, but in stating it Prof. Filkins, in the sixth line, says "for maximum l," etc. This should read for minimum l, since it is evidently the minimum value of l that determines the possibility of the rod being pushed up the chimney. It is also evident that the maximum value of l to fulfill the equation in the fifth line is infinity. DARRAGH DE LANCEY.

Rochester, N. Y., January 9, 1898.

[We do not agree with our correspondent that the solution should read "for minimum l," etc., since the question asked for the longest pole, and "l" is the length of the pole. It is an entirely different point to show that the longest pole which will pass the three points on the line, l, as drawn, is also the shortest line which can be drawn from the back of the chimney past the front of the chimney to the floor. It is not "evident," as this letter states, that "the minimum value of l determines the possibility of the rod being pushed up the chimney." It becomes known when "l" is proved to be the minimum line, and is not axiomatic.—EDS.]

Raising a Stranded Cruiser.

Electrical appliances have been of much service to Russian engineers in the recent work of raising a great ship, says The Western Electrician. The cruiser "Rossia," 480 feet long and of 12,000 tons displacement, one of the largest ships of the Baltic fleet of Russia, ran aground a year ago on a bank of the Neva in 20 feet of water. The water fell afterward so that the boat pressed on the sand and gravel below with a load of 2,500 tons. Attempts to pull her off having failed, the Admiralty applied to the imperial school for divers at Kronstadt. Operations were begun in the middle of winter, when the ice was so troublesome that the cruiser could not be kept clear, and the operations had finally to be conducted from tents erected on the ice. The first thing was to ascertain exactly how the boat was lying. For this purpose long poles were fixed in the bottom in an oblique position close to the hull; the divers, descending along these poles and communicating by telephone with the men above, took their meas urements by means of the plumb line. The rudder was found to be free; most of the keel was buried in the ground. When the relief had been mapped out, an iron pipe 60 feet long and 2 feet in diameter was inserted in the soil underneath the keel, and the keel cleared in this way. The hydraulic current was so strong that one of the divers was upset, though 60 feet away from the mouth of the pipe, and the 200 candle power electric lamps which the divers had did not penetrate through more than a foot of the turbid water. But the process was entirely successful. By the middle of December only a small part of the keel was still embedded. The operations were carried out in a thoroughly scientific and practical manner. The success is partly attributed to the telephone and the electric lamps, which did a good deal to cheer the divers up. They could never bear the cold for more than half an hour. The outfits had been obtained from France. In the cold water the rubber shirts became quite brittle and had constantly to be reheated; the air pumps also needed heating; the automatic valves contracted so much that the divers were soaked; the leather collars of the helmets broke when the divers put their dress off again.

Death of M. Bazin, Inventor of the Roller Steamboat.

Advices from Paris, of January 21, announce the death of M. Ernest Bazin, the inventor of the roller steamboat, which was designed to avoid the friction of the water against the hull as the boat was forced forward by the rotation of drum-like wheels of large flotative capacity. The trial boat was about 250 feet long, and had three pairs of such supporting wheels, each driven by a separate engine. Full particulars of this boat, with ample illustration, will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1143.

Recent Archæological News.

The castle of Godfrey of Bouillon in the Ardennes is to be restored by King Leopold, of Belgium.

Leonardo da Vinci's anatomical studies from the manuscripts in the royal library at Windsor have just been published for the first time at Rome, edited by Prof. Pinmati, under the title, "Dell' Anatomia." Besides the artist's notes over 250 drawings are reproduced.

Thorwaldsen's "Lion of Lucerne," cut in the living rock, is cracking and crumbling away, owing to the infiltration of water in the sandstone cliff of which it forms part. It is to be preserved by isolating it from the main body of sandstone and draining the ground around it.

Aurelian's city wall along the left bank of the Tiber is to be torn down, as neither the Italian government nor the Roman municipality will repair it. It contains fragments of older walls, including, it is believed, part of the wall of Servius Tullius, and has been repeatedly repaired by later emperors and by some of the popes.

A decorative art commission has been formed in Paris under the name of "Société de l'Art Precieux de France," with Gérôme, the painter and sculptor, at its head. Its object is to improve the artistic standard of French "objects of art." Works approved by it will be stamped with its mark, which will serve as a guarantee to purchasers, and only French productions will be examined.

The class of 1881 of the University of Princeton has added to its memorial collection of ancient casts in the Art Museum a valuable series of casts of ancient sculpture on the Triumphal Arch of Trajan at Beneventum. The casts for nearly all of the sculptures were made for the first time by the American School of Classical Studies in Rome, under the direction of Prof. A. L. Frothingham, Jr., two years ago.

Excavations have been made recently in the remains of the old Roman colony, Vindonissa, at Windisch, Switzerland. The most important results are the disinterment of large Roman villas and the amphitheater, besides a quantity of coins, pottery, bronze, iron ware and some large silver vessels, which have their equals only in the famous treasure trove of Hildesheim, Germany, brought to light in 1868.

Prof. Dörpfeld, the Director of the German College of Archæology, at Athens, who has been engaged in excavations between Pynx and the Areopagus, believes that he has discovered the ancient system of drainage, with all its ramifications. The pipes, which are in an admirable state of preservation, conducted to the various quarters of the city the water flowing from Mounts Pentelicus and Hymettus, and the small streams from the Acropolis, as is shown by the stalactites still visible. The drains are large enough to permit of a man walking upright in them for a considerable distance.

In the heart of the little town of Santa Barbara, California, an archæological excavation of interest is in progress, says The Antiquarian. A few months ago the accidental discovery was made that the heights of Castle Point had been long, long ago an Indian burying ground. At once Mr. Louis Dreyfus began excavations, which are not yet completed. But already plenty of bones, dust of bones, spear heads, stone implements, arrow heads, shells and beads have been brought to light. This discovery is rather significant, in that it is thought to be the initial point for prehistoric study in all this region.

The excavations that have been going on for months past on a plot of ground belonging to Herr Schabb, a manufacturer at Treves, have resulted in the discovery of a Roman private house, which will excite the interest of antiquaries almost as much as the famous public buildings at Augusta Trevirorum. The front of the house, says The London Standard, lies parallel with the principal street of the old Roman city. A number of blocks which served as pedestals for the wooden or stone pillars of a portico still remain. The entrance is distinctly recognizable between two buttresses and an immense heap of stones. A long entrance hall running right through the house, from front to back, is intersected by another corridor, so that the gigantic building is divided into four parts. Side corridors lead into the rooms. Of these, the marble tesselated bath rooms for hot and cold water and warm air lie side by side, and deserve special mention. The two latter were supplied with warm air through subterranean passages. The escape of the smoke was effected by means of hollow tiles laid on one another. The southwestern rooms have cellars under them. In a light court in the same part of the house there is a well-preserved window, the first ever found in a Roman building. The most interesting thing, however, is the magnificent and richly colored mosaic floor, a rarity of the first order. Experts assign the building to the first half of the fourth century, when Augusta Trevirorum attained the zenith of its splendor under Constantine and his sons.

Science Notes.

Experimenting with gold fish on the relative toxicity of the alcohols, Picard finds that this is directly as their molecular weights, and after a long series of experiments, concludes that the relative toxicity may be expressed by the following figures: Methylic alcohol, ⅔; ethylic, 1; propylic, 2; butylic, 3; amylic, 10. These results are contrary to those of Dujardin-Beaumetz, in so far he found methyl to be more poisonous than ethyl alcohol.—Comptes Rendus, cxxiv, 829.

The researches and experiments of Messrs. Broca and Richet, specialists in this line, have led them to the interesting conclusion that the cerebral nervous system is really incapable of perceiving more than the average of ten separate impressions per second. The mental phenomena in this case show that after each excitation of the nerves a period of inertia follows, lasting about one-tenth of a second, and during this brief period no new or appreciable impression, they declare, can possibly be made. Further, according to the studies of these same eminent authorities, an individual cannot make more than ten or, at most, a dozen separate voluntary movements of any kind or nature in a second, although the muscles, independently of the will, are capable of making as many as thirty or forty.

Prof. Lippman, of Paris, gave on December 18 an interesting lecture before the Photographic Society in London on the process of photographing objects in natural colors. He declares that he has solved the problem of directly fixing colors with a single exposure. After the sensitive side of the plate or film has been rendered grainless and transparent it is brought into contact with a metallic mirror. The contact is effected by a falling slide from behind with mercury, which after the exposure is let down into a reservoir, the plate being taken out for development, which is managed in the ordinary way. The result is a negative upon which, as the process of drying goes on, the colors appear true and bright in proportion as the exposure and development have been correct. Several specimens were shown, and the effect obtained was excellent.

The Lancet states that a surgeon in the United States Navy reports as the result of an examination in Japan the finding in that country, among 1,200 soldiers, some 1·58 per cent who were red blind and 0·833 per cent who were green blind; among 373 boys, 1 per cent were red blind, and among 270 girls, 0·4 per cent. Of 596 men in Kioto, 5·45 per cent showed defective color sense. Dr. Fielde, of Swatow, China, examined 1,200 Chinese of both sexes, using Thompson's well-known wool tests; among 600 men were nineteen who were color blind, but among 600 women only one. It seems, therefore, that the percentage of color blindness among Chinamen is about 3 per cent, and consequently does not vary greatly from that in Europeans. It was found, however, by Dr. Fielde that fully half the number who were tested mixed up blue and green, and, according to this investigator, many of that race are quite blind to the perception of violet colors.

Under the title of "Electric Balloon Signaling applied to Scientific Exploration in Arctic and Antarctic Expeditions," a lecture was delivered at the Imperial Institute on Monday, November 22, by Mr. Eric Stuart Bruce, M.A. Oxon., F.R. Met. Soc. The lecturer demonstrated by various experiments the system of electrical balloon signaling invented by himself. In this system several incandescent electric lamps are placed inside a translucent balloon made of goldbeater's skin. By varying the flashes of light in the balloon, signals are given according to the Morse or other code, the operator remaining on the ground. Want of such means of communication between the ship and exploring parties in Arctic exploration was fraught with danger, while, if the light were raised 500 or 1,000 feet above the vessel, its value would be incalculable. The various objections to the system were considered in detail, Mr. Bruce concluding a most interesting lecture by a number of striking experiments illustrating the advantage of his system.

Dr. Campbell Morfit, the distinguished American chemist, died in London on December 8, in his seventy-eighth year. Dr. Morfit was born in Herculaneum, Mo., on November 19, 1820. He was educated at the Columbian University, Georgetown, D. C., but before graduation took up the study of chemistry in the private laboratory of James C. Booth, in Philadelphia. He originated the chemical department of the Maryland Institute, and in 1854 became professor of applied chemistry in the university, where he remained for four years. In 1858 he removed to New York, where he followed his profession until 1861, when he went to London. He was a member of various scientific societies and a fellow of the Chemical Society of London and of the Institute of Chemistry. Besides writing numerous scientific papers, he was joint author with James C. Booth of a report to the United States Ordnance Department on gun metal, in 1853, from investigations by him in a laboratory that he established on his own plan at Pikesville Arsenal, Maryland. He was co-editor with Dr. Booth of the "Encyclopedia of Chemistry" and published many works.

© 1898 SCIENTIFIC AMERICAN, INC.

HOMING PIGEONS IN NAVAL SERVICE.

The United States Navy, in organizing a homing pigeon service, places itself in line with the European powers, who for some years have trained birds to cover many routes. Among other lines of flight, the German authorities have had pigeons trained to fly from the coasts of England to Germany—a very suggestive line of operation. In this country the Navy Department propose to establish some twenty-two cotes of pigeons along the coast. Allowing a homing radius of one hundred and fifty or two hundred miles, it will be evident that a wide belt of water along the coast could be thus covered. The object of the birds is to establish communication between vessels of the navy and the shore. The usual direction would be shoreward from a vessel, though for short distances the flight might be in the other direction.

The pigeon used is termed a homing pigeon. The popular term, carrier pigeon, does not belong to the message-carrying bird at all. The carrier pigeon is practically a fancy name which has attached itself to a special breed of pigeons.

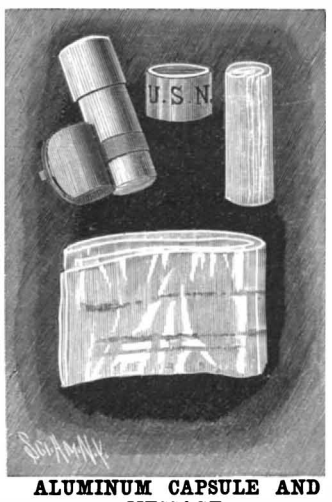
Our illustration shows a pigeon house of a type adopted for use by the navy. It is a two-storied structure twelve feet square. It is divided within by partitions of wire gauze, so that the male and female birds can be separated if desired. Around the sides roosting brackets are secured. These are made of boards nailed together so as to form an inverted V, like a section of a board trough. The brackets project about one foot. It is found that roosting poles, such as used for chickens, are not advantageous, as one pugnacious bird will often take possession of an entire pole, and will drive others away from it.

One or both stories of the building are provided with a homing trap. One is shown on the second story to the left in the cut. An opening partly closed with wire gauze leads into the loft. The lower portion of the opening is closed by a number of short rods which hang loosely from a wire crossing the opening about six inches above its bottom. These rods swing freely in or out, so that a bird can pass through in either direction by pressing against the rods and pushing them forward. Near the bottom of the opening a couple of sockets are fastened to the inner faces of the frame. A wire dropped into these and outside of the row of swinging rods prevents them opening outward. When the rod is in place the comblike row of swinging rods acts as a valve. A pigeon can come in but cannot escape outward.

A homing pigeon coming from a distant ship flies at once to the trap and enters the house. Once in, he cannot fly out again. He is kept there in order that his message may be secured. On the shelf which may be termed the floor of the trap are two plates of thin iron, arranged so as to oscillate like a child's seesaw about an axis parallel with the wall of the loft. These cover the entire width of the shelf. A bird in entering walks across one of them and causes it to oscillate or balance over through a very small arc. As it does this it closes an electric circuit and rings an electric bell, which is placed in the attendant's office, so as to notify him of the arrival of a bird.

A peculiarly shaped door is shown in the cut, swung upward against the eaves of the roof. This is a wooden framework covered with wire gauze. When in place it shuts the trap within a cage, as the stationary frame projecting from the house is also covered in with wire gauze on its sides and top. This arrangement is used in training. Every bird to be used for homing purposes has to be taught to go through the trap. This is effected by shutting him up in the cage outside the trap and by attracting him through it by distributing food on the floor inside. The birds may be kept in the cage with trap open for several days. Then the swinging rods are lowered, and an old bird is placed with those in training to show them the way through. They may also be passed through by hand to accustom them to the rods.

The training process consists in carrying the birds progressively increasing distances away from the home station and releasing them. The best system is to gradually increase the distance; diminishing it, or flying them "backward," as it is called, is considered bad practice. The wonderful achievements of the birds are as purely instinctive as any action can be. A slight change in the partitions of the house has been found to so disconcert them that pigeons coming from a distance, during whose absence the change had been made, would not enter by the trap.



ALUMINUM CAPSULE AND MESSAGE.

To identify each bird a ring of aluminum, bearing the year, the pigeon's number and any special mark, is placed on the leg. This is done when the pigeon is but a few days old. The three forward toes of the foot are placed together and the ring is slipped over them. The fourth rear toe is gently held against the leg pointing upward, and the ring is slipped over it. As the toe is released it goes back to its proper position and the ring is secure and may never come off until the death of the pigeon.

Each pigeon is also stamped in red indelible ink with the designation of the federal navy upon the under side of his pinions. This is stamped repeatedly upon a number of feathers, so that as long as any wing remains some impression of the stamp can still be read.

The messages are written on a sheet of thin paper about four by five inches area, with printed heading. They are put in aluminum capsules, very similar to druggists' gelatine capsules. These are secured by a little clamp to the leg.

The longest distance from which a bird has reached the New York navy yard is one hundred and fifty miles, from the neighborhood of the capes of the Delaware. Each bird is preferably trained in one direction only, and until in their second season the birds are not expected to fly anything exceeding a hundred mile flight. In careful short distance training not over ten per cent of the birds are lost. In long distance work one-half may be lost.

The cote is painted in stripes to make it conspicuous for the birds.

The present six stations, five distributed from Portsmouth, N. H., to Key West, Fla, and one at Mare Island, Cal., will be supplemented in part at least by stations at lighthouses. It was intended at one time to utilize life saving stations, but various reasons militated against the idea.

STATION FOR HOMING PIGEON SERVICE OF THE UNITED STATES NAVY.

The Early Use of Watertight Bulkheads.

The division of a hull of a vessel into compartments is of a more distant period than is generally supposed. As early as the beginning of the nineteenth century the Chinese divided the holds of their trading vessels, intended for distant waters, into a number of smaller holds or spaces. Those compartments were separated by partitions or bulkheads made of three inch plank, and calked with a gum that was mixed with lime and threads of bamboo—a composition that readily hardened when brought into contact with water. The number of compartments depended upon the number of owners in the vessel. In a large vessel there were sometimes as many as one hundred, each partner shipping his goods in his own berth, which he fitted up to suit himself, and either went in person or sent one of his family to take charge of his property. At just what time this division of the hull was first adopted does not appear to have been recorded. It may have been very old at the period named. The compartments, it will be seen, were made for commercial economy rather than for the safety of the vessel. Use of bulkheads for safety purposes was probably first made in the Western rivers of the United States. As early as 1820, not ten years after the introduction of steam navigation on the Mississippi and Ohio rivers by Robert Fulton, the hull of the steamboat "Columbus," running between New Orleans and Shippingport, Kentucky, was torn open by a snag, but the vessel was "saved from sinking by having a snag room, which apartment alone was filled with water."—Cassier's Magazine.

To observe plants growing under the microscope The American Monthly Microscopical Journal says: Procure a little collomia seed. Take one of the seeds and with a razor cut off a very tiny slice, place it on a slide, cover with a cover glass and place under the microscope. The instrument must be in a vertical position. When it is well focused and lighted, moisten it with a drop of water. The seed will absorb the moisture and throw out a very large number of spiral fibers, giving the appearance of veritable germination. Beginners will find it easier if one applies the moisture while the other looks through the instrument.

© 1898 SCIENTIFIC AMERICAN, INC.

CURIOS FROM BENIN.

The city of Benin, not far from the Niger, in Guinea, Africa, has proved a mine of ethnographical treasure, quite eclipsing in this respect the more familiar capital of Ashanti. The number and excellence of the carved ivory tusks and castings in bronze or brass which have already reached this country have taken experts completely by surprise. The accompanying illustrations represent a few specimens. They are bronze or brass plaques with figures in relief, selected from a collection of about three hundred now exhibited, by the courtesy of the Secretary of State for Foreign Affairs, in the British Museum, whence it is hoped that the greater part will never be removed. For what purpose these plaques were used we have at present no accurate information, but the holes at the corners suggest that they were nailed against the walls of a house or temple. They nearly all show signs of having been buried in the earth; and it seems that they were not, like the ivory tusks, actually seen placed in the positions for which they were designed. The high relief and extreme elaboration of the figures make it clear that the process adopted in their manufacture can only have been that known as the cire perdue, a process generally necessitating the destruction of the mould after use upon a single occasion. The briefest of summaries of this method may not here be out of place. A model is first made in wax. This is then covered with a coating of finely levigated clay. A hole is now made in the clay, and heat is applied in order that the wax may run out. Into the clay mould thus formed the molten metal is poured. From such facts alone some idea may be formed of the artistic and mechanical skill possessed by the unknown artificers to whom these remarkable casts are due.

Fig. 1.—EUROPEAN WITH MATCHLOCK.

The subjects represented may be roughly divided into three classes. The first consists of human figures, and principally those of native chiefs, warriors or musicians, either singly or in groups. The second draws its inspiration from the animal world, leopards, crocodiles, serpents and fish being especially conspicuous. The third embraces such inanimate objects as armlets, knives, a leopard's skin and a tree which appears to be the Palmyra palm, with its fruit depending from it. The first and largest of these classes is the most interesting from almost every point of view, but more especially because the artists have not entirely confined themselves to the representation of their own countrymen. A glance at Nos. 1, 3 and 5 will at once suggest the non-African origin of their subjects. The figure in No. 1 has a matchlock in his hand, and appears to be wearing a kind of ruff. It seems incontestable that he is a European of the sixteenth century. Nos. 3 and 5 present us with a variant on this type. The full-bearded faces are certainly not those of negroes, while the noses are of the pronounced aquiline contour usually associated with the Semitic race. It is not necessary, however, to seek their prototypes in Asia; for even if Semites had a monopoly of the hooked nose, the fact that the features of No. 1 are modeled in a very similar way should make us cautious in emitting any theory of an Asiatic origin. Opinions on a subject requiring so much further elucidation are naturally subject to revision; but there seems nothing inherently improbable in the guess that Nos. 3 and 5 represent Europeans of rather earlier date than No. 1. Antonio Galvano tells us that the kingdom of Benin was discovered by one Sequeira about 1472; and that about 1485 "one John Alonso d'Aueiro came from the kingdom of Benin, and brought home pepper with a taile: which was the first of that kind seene in Portugall."

Fig. 3.—HEADS OF EUROPEAN TYPE.

In the long period of commerce and adventure which ensued, European fashions changed more than once. In this connection it is interesting to remark that another plaque in the collection wears a kind of hood with a vandyked edge, which, as Mr. C. H. Read has pointed out, had almost, if not quite, gone out of fashion in the sixteenth century.

The remaining illustrations have not quite the same high interest for us as those already mentioned. No. 6 represents leopards tearing the body of what may be meant for a calf. This kind of theme has several parallels. In No. 2 we see two native executioners, each bearing the ax of their office and wearing on their breasts the bell which announced the doom of their victims In the Ethnographical Gallery at the British Museum may be seen a dress faced with red cloth and fringed with long pendants, terminating in little bells, which may well be the kind of garment from which those worn by these cast figures were modeled. In the same place may be seen the originals of the bell which is so constantly seen worn round the neck, and of the curious horned box which is sometimes held in the hands. The three persons in No. 4 are more enigmatical. The two lateral figures may be attendants, supporting the arms of a central princely or divine personage. There are other analogous groups in the series, in which the lateral figures are kneeling, while the central figure is seated on a stool. In other casts,

Fig. 5.—FIGURE OF A EUROPEAN.

Fig. 2.—NATIVE EXECUTIONERS.

Fig. 4.—FIGURES SUPPOSED TO REPRESENT A NATIVE CHIEF AND HIS ATTENDANTS.

Fig. 6.—LEOPARDS DEVOURING A SLAIN ANIMAL.

© 1898 SCIENTIFIC AMERICAN, INC.

again, the arms of a central figure are similarly supported, while he holds in his hands knives or other objects not easy to determine, for in most cases they have, unfortunately, been broken off.

Much might be written about these interesting objects. They abound in illustration of native costumes, weapons, musical instruments, and, in a less degree, of African fauna and flora. And yet they only represent one style of the castings which have reached us from Benin, for the more life like figures in the round are not represented among them. The portraits of Europeans give us some idea as to date; possibly a chemical analysis of the material out of which they are cast might furnish us with further evidence. For if they are brass, a knowledge of the date when brass was first exported to West Africa might have an important bearing on the question. Whatever may be the origin of some of their peculiarities of style or ornament—and these are both various and remarkable—it seems unlikely that a hoar antiquity can be ascribed to the bronzes themselves. But whether they are the work of negroes or of some wandering tribe of alien craftsmen, with whom casting was an hereditary occupation, they are certainly the most interesting works of art which have ever left the western shores of the Dark Continent. We are indebted to The Illustrated London News for the engravings and article.

Mr. Landor's Expedition to Tibet.

The Chronicle publishes, says The New York Sun, a vivid description of the torture inflicted in Tibet on Mr. Landor, the British explorer, who sought to reach Lhassa, and his two faithful Hindoo servants, all the other members of the party having deserted their leader. The following is a sample of the tortures inflicted:

The victims were bound naked to a tree and slashed and bruised, the cords cutting deep into their wrists and ankles. Mr. Landor's eyes were burned with red-hot irons. He was bound for hours on a rack and twisted and wrenched out of all semblance to a man. He was made to ride eighty miles on a saddle stuck full of spikes. One of these entered the base of the spinal column and shattered the nerve centers. His flesh was reduced to a lacerated jelly. An attempt was made to draw from him or his men some expression of pain, but in vain.

Mr. Landor has quite lost one eye, though the doctors say that in time sight may return. The hot irons were held just close enough to his eyes not to touch the skin, with the result that they were withered and shriveled, the Tibetans deeming this more painful than instantly burning out the eyeballs. Day after day this was practiced, but no sign of feeling were they able to extract. Landor's ankles and wrists are still livid from the cords with which he was bound on the rack, and, as he says, an animal in his condition would be instantly shot.

With indomitable will he forces himself to stand and walk and sit, using his extremities as wooden machines, declaring that they were made to use, and use them he will.

A photograph of the victims after their release shows them to be unrecognizable. Years seemed to have passed over their countenances. The skin is lacerated and seamed with burns and slashes. The hair is burned to the scalp, the beard singed to powder, the eyebrows and lashes burned to the quick, and the eyes two ghastly slits.

When the rescuers, two Englishmen and a Hindoo, reached the sufferers after thrilling adventures, Landor was within a few hours of death. His reason had already gone, and it was only by the most prompt action that he was kept alive. After three hours' attention he so far regained consciousness that he was able to tell where he had concealed one of his cameras, and he caused to be taken, for he could not take it himself, a photograph of the savages cowering in terror of the avenging white men.

Never for a moment during all the horrible time did Landor forget his photographs and sketches. Up to the moment of his capture he had kept his diary complete. After that time each hour was impressed with hideous vividness upon his mind.

His outfit has now been given up and his precious diary and maps of surveys secured. Many of the instruments with which he was provided by the Royal Geographical Society he was obliged to bury in the Himalayas. There they will lie for a time until some brave man recovers them. Landor himself will probably never be able to return.

[The tableland of Tibet in the heart of Asia is 10,000 to 17,000 feet above the sea and is a cold and forbidding country. Foreigners have been systematically kept out of the sacred city of Lhassa. Thomas Manning, in 1811, was the first Englishman to visit Lhassa and Mr. Landor will probably be the last, as the Grand Lama is determined to keep out foreigners from the famous pilgrimage city of the Buddhist world. The attitude of the authorities of Lhassa is not hostile to foreigners except as concerns their city, and those who push on toward it do so at their peril, as the refusal to permit the entrance of visitors is based entirely on religious grounds. Viewed from this standpoint, their attitude is justified. Tibet has been a dependency of China since 1720. Imperial delegates direct the foreign and military administration of the country, while in matters of civil and religious government the supreme authority is the Grand Lama, who resides at Lhassa in the Potala or palace temple.—ED.]

World's Consumption of Metals.

With the exception of iron and steel (which were produced in 1896 in quantities as follows: Pig iron, 8,623,127 tons; steel, 5,281,689 tons), the common metals used in large quantities are: Copper, of which the world produced in 1896, 387,207 metric tons; lead, 670,000 metric tons; zinc, 421,313 metric tons; tin, 83,000 metric tons. Next to these, probably at present heading the list of minor metals, is aluminum, with a production of about 3,000 tons in the year 1896 and less than 4,000 tons in the year 1897.

The investigation of what becomes of such enormous quantities of the common metals, which are produced every year at an increasing rate, is an interesting one. The amount of scrap in any second-hand form of these metals which is being sold upon the market is not a very large factor.

With lead, by far the greater portion is converted into white lead, red lead, and orange material, which are used as pigments of paints, which are distributed over great surfaces in such thin coatings that their metallic contents is practically never recovered. A good deal of lead is manufactured into sheet, and a considerable proportion into bullets, shot and other projectiles, and, though still remaining in a metallic form, it is so widely distributed in use as to cause it to be irrecoverable in the form of scrap. A portion of the lead product used as sheet lead and pipe does come back into the market, but the portion of lead used in these ways is comparatively small as compared with the other uses of the metal.

The consumption of zinc is largely in galvanizing steel or iron sheets; in the manufacture of brass; as sheet zinc; and as the oxide of zinc used as a pigment in paint. That portion of the metal which is used in galvanizing is distributed as a thin covering over a large surface of iron; and the metal is entirely lost in the oxidizing and general disintegration of the zinc sheet. It has never been attempted to recover the zinc from galvanized iron. Zinc which is manufactured into brass, in the proportion of one-third zinc to two-thirds copper, remains in a permanent form, which is often available for new use as scrap brass, which, next to iron and steel, is the largest commodity in the scrap metal market.

The major portion of the tin product of the world is used in covering tin plates. Ordinary tin plates carry 1½ to 3½ per cent of tin. Many attempts have been made to recover this tin from old tin scrap, but no considerable amount of metal has thus returned to the markets of the world as recovered from tin scrap up to the present time.

With reference to iron and steel, it is interesting to note that the weekly production of coke in the Connellsville district is over 150,000 tons.

Of the common metals next to iron and steel, copper is the one which is used in the largest extent in the metallic form; only a small proportion of the production being utilized in the salts of copper, blue vitriol (the salt of copper used in galvanic batteries) being the principal salt of the metal sold in the market. The great uses of copper are in the manufacture of brass, of which it forms a two-thirds component part ordinarily, and in electrical conductors and in the form of sheet used in roofing, the bottoms of cooking and other utensils, in the manufacture of pipes to be used where a considerable amount of elasticity and pliability are required. The proportion of scrap copper for sale in the market is greater than that of any other metals, with the exception of iron and steel, but the total amount of old copper offered for sale is comparatively insignificant compared with the total copper production.

As indicative of the world's consumption of electrical conductors, it is interesting to note that the total length of the world's telegraph system has reached 4,908,823 miles, exclusive of 181,440 miles of submarine cables. This mileage is apportioned as follows.

Europe	1,764,790 miles.
Asia	310,685 "
Africa	99,419 "
Australia	217,479 "
America	2,516,548 "

America still leads the van, with almost double the mileage of telegraph lines of Europe.

As compared with the tonnage of the more common metals, the consumption of aluminum, nickel, antimony, bismuth and the like, is comparatively very small.

The increase in the consumption of aluminum has been very marked within the last ten years, and it is confidently believed the metal will soon obtain a place with a tonnage commensurate with the tonnage of the other common metals.

The steps which have been taken by the Pittsburg Reduction Company during the past year, by which aluminum sheet is now 10 per cent cheaper than brass and 15 per cent cheaper than copper, section for section, and the steps which are now being taken to produce aluminum for electrical conductors as a substitute for copper make us more confident than ever that the metal whose interests we have espoused is destined to be ranked with the common metals, not only in the number and character of uses of the metal, but in the actual tonnage of metal produced and consumed in the world.

The exports of all the metals, including aluminum, show a very satisfactory increase, both in quantity and value, for the first eight months of last year as compared with a like time in 1896.

The building of electric railroads in Europe is increasing, and heavy contracts for equipping these roads have lately been placed with American manufacturers, which will result in large exports of copper and aluminum to England, France and Germany. Zinc, lead and aluminum have each had marked increase in exports from the United States during the past year. —Alfred E. Hunt, in Aluminum World.

Capture and Arrest of a Set of Patent Swindlers.

We learn with much satisfaction, through The Inventive Age, that on November 18, 1897, a set of patent swindlers were arrested through the efforts of United States Post Office Inspector Holmes, and indicted by the federal grand jury at Indianapolis, Ind. They were John S. Thurman, E. T. Silvius, and J. C. Bugess, known as the "blacksmith." The members of another set arrested in Cincinnati, Ohio, were Alpheus Fay, C. B. Avery, doing business under the name of C. B. Avery & Company, and John Burnit, a model maker. John Leavell, another member, was arrested at Louisville, Ky. Some of the parties have given bonds for appearance, while others have been committed to jail in default.

Inspector Holmes has evidence to show that Avery & Company have been sending out about 1,000 letters a month to inventors. He has also accumulated a large amount of evidence about similar cliques of swindlers throughout the country, and from now on it is expected a fierce warfare will be carried on against these disreputable frauds.

The peculiar frauds which these parties are guilty of we described some time ago, consisting of securing abstracts of titles and basing thereon fraudulent prospective sales of patents.

If there was any delay on the part of the patentee, the broker would demand funds to pay his railroad fare to the place where the supposed purchaser was. In nearly every case where the fare was sent, the broker would not make the trip, but pocketed the money.

The next stage in the fraud was to tell the inventor that the prospective purchaser was all right, but that before the inventor could be put into correspondence with him, the attorney would demand that, as his pay, he be given one-tenth interest in the patent. The necessary papers would be drawn up and then the inventor would be given the name of the intended purchaser. The latter, after corresponding for a short time, would tell the inventor that he must show that he had a clear title to the patent. Of course, it was encumbered with one-tenth, which he had given to his attorney. The latter would inform the inventor that he would release himself from any further interest in the patent if the inventor would pay him say $100, or more if possible. If the inventor fell into the trap, the would-be purchaser would suddenly give some excuse for not wanting the patent, and there the matter would end. Then, again, the inventor would be made to sign over the patent right before any money was paid over, and the patent would be stolen.

There are likely to be other ingenious, plausible schemes got up to defraud inventors and patentees, and though successful for a time they are bound to be checked, if brought to the attention of Inspector Holmes or the Patent Office. It is a great gain to secure the assistance of the Post Office Department in putting a stop to these frauds.

Prof. Libbey's Hawaiian Expedition.

Prof. William Libbey, of Princeton University, proposes to conduct a scientific expedition to the Hawaiian Islands during the coming summer. He will take four or five students with him, and the party will be gone four or five months. Prof. Libbey went to Hawaii a few years ago and he is thoroughly convinced there are scientific treasures in the islands, duplicates of which cannot be found elsewhere. The party will thoroughly explore the lava beds, the forests and other places likely to contain specimens of biological, archæological or botanical value.

Bolivian Trade Mark Law.

According to the decree of March 24, 1897, the registration of trade marks is compulsory in Bolivia, that is, no goods bearing a trade mark can be sold or offered for sale in Bolivia unless the trade mark has been previously registered. In case of non-compliance, fines will be imposed. The registration is for a term of ten years and may then be renewed, but annual taxes must be paid to keep the registration in force.

© 1898 SCIENTIFIC AMERICAN, INC.

A NINETY MILLION CANDLE POWER ELECTRIC BEACON.

A truly gigantic electric light beacon, shown in the accompanying illustrations, is just now being made the subject of a series of tests at the United States Lighthouse Depot, at Tompkinsville, Staten Island, N. Y. It was manufactured by Henri Lepaute, of Paris, and was first exhibited at the Chicago World's Fair and subsequently at Atlanta and Nashville. It consists of two great lenses, each 9 feet in diameter, between which, in their focus, is placed a 9,000 candle power arc light. The valves and the light are carried

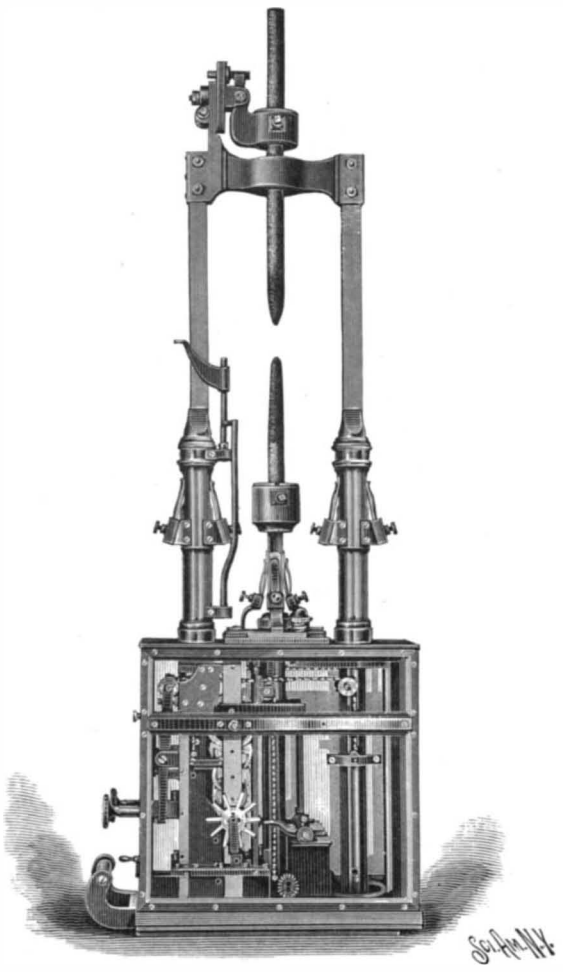


Fig. 1.—THE NINE THOUSAND CANDLE POWER ARC LAMP.

by a vertical shaft which terminates at its lower end in a hollow drum, which latter floats in a bath of mercury, Fig. 2. The great weight of the lantern, estimated at several tons, is thus carried by the mercury, and friction is reduced to such a point that the whole mass may easily be rotated by the pressure of one's finger.

Each lens consists of a set of lenses and prismatic segments, Fig. 3, which are built up concentrically within a stout framework of brass, into which the segments are carefully cemented. The center of the lens consists of a solid disk. Surrounding this are eight concentric prisms, whose edges are in contact, and surrounding these are fourteen larger prisms, making 190 separate segments in the whole lens. The angles of the prisms are such that the rays of light are refracted so as to leave the lens in parallel non-divergent rays, and it is estimated that the 9-foot beam of light thus projected is of 90,000,000 candle power. The lantern is rotated by means of the clockwork which will be noticed at the right hand side of the framework. As there are two beams of light and the period of rotation is 10 seconds, every part of the horizon receives a flash once in 5 seconds, the duration of the flash being about one-twelfth of a second.

The illuminant is an arc lamp of 9,000 candle power, which is so constructed that the arc will always remain in the exact focus of the lenses, the latter being so placed that their foci coincide. The maintenance of the arc in a fixed position is secured by connecting the carbon holders so that they both travel simultaneously and at the same speed, as the carbon points are burnt away. The carbons are fed together by the clockwork which will be noticed in Fig. 1, inclosed in the base of the lamp. The mechanism is controlled by an electromagnet arranged in shunt around the arc. As the carbons are burnt away the resistance of the arc increases and the magnet releases the clockwork escapement, permitting it to bring the carbons together. The feed is slow and frequent, maintaining the arc at a practically uniform length

The carbons vary in size from ⅝ to 2½ inches diameter, and the 55-volt current will vary from 25 to 100 amperes, according to the carbons used. The current will be furnished by an alternating generator made by the General Electric Company, driven by a 25 horse power Ideal engine, steam being supplied by a 25 horse power Fitzgibbons boiler. When the lens is installed at a station the steam and electric plant will be furnished in duplicate, so that, should one set be disabled, the other can be brought at once into use.

As a precaution against the extinction of the light through the failure of the lamp, the whole lamp with its mechanism, as shown in Fig. 1, is provided in duplicate, the two lamps being carried at each side of a turntable, which is a permanent fixture within the bivalve lens. The turntable is placed to the left of the common focus of the lenses in such a position that on rotating it either of the lamps may be brought at will into the focus. The lamps are carried on a sliding rest on the turntable, and by means of an endless screw operated by a handwheel on the outside of the lenses they may be drawn out for inspection or repairs.

The theoretical luminous range of this giant lens in clear weather is 146·9 nautical miles; and if the light were placed on a sufficiently lofty eminence to compensate for the curvature of the earth, it would be possible, under favorable circumstances, to see it at this distance. The geographical range, as it is called, depends on the height of the focal plane above the sea level. If the light were to be installed at Barnegat, where the height of the focal plane is 165 feet, the light would be visible from a vessel's deck at a height of say 15 feet above the water at a distance of 19 nautical miles in clear weather, and, on account of its great power, at the same distance in hazy weather.

In a dense fog, however, even such a great light as this would be practically extinguished. In this latitude the light may be expected to be seen to the limit of the geographical range for 330 nights out of the year.

The present tests are being carried out by Lieut.-Col. D. P. Heap, Corps of Engineers, U. S. A., engineer of the Third Lighthouse District, to whom we are indebted for particulars and photographs used in the preparation of the present article.

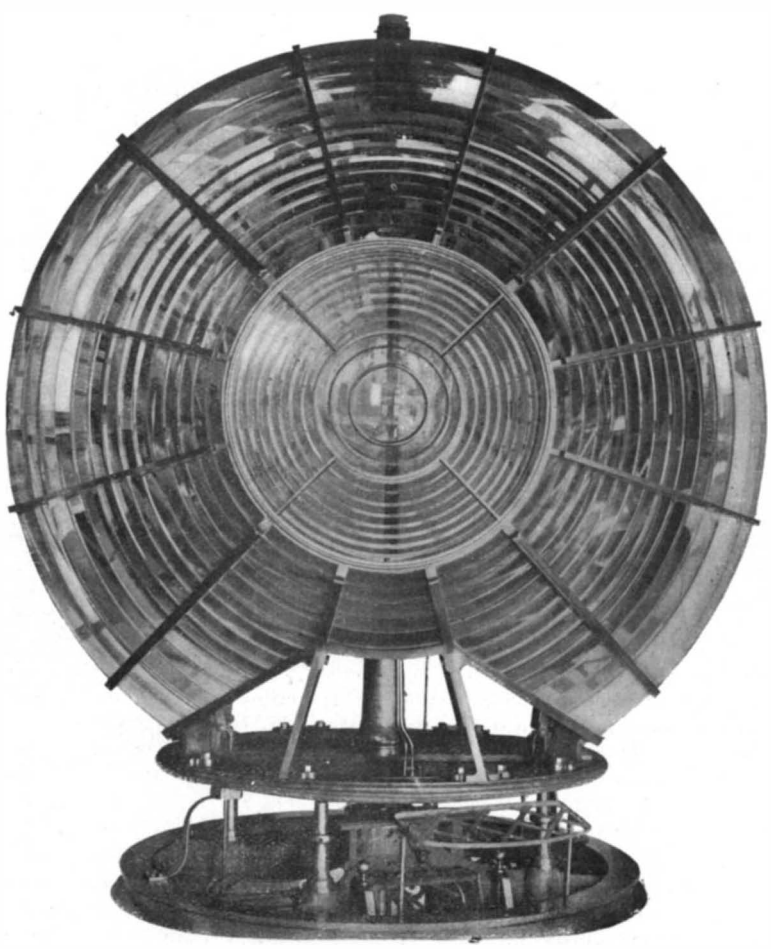


Fig. 3.—FRONT VIEW OF LENS.

Prof. Marsh's Gift to Yale.

No gift for natural science which Yale, or perhaps any other American university, has received equals in value the collection that Prof. Marsh has just presented to Yale University. It represents not only the untiring labors of a lifetime of a great specialist, but a large expenditure of money by Prof. Marsh, especially in the organization and work of the expedition which he led with fruitful results in the Rocky Mountain region of the far West.

The collection includes, first, the collection of vertebrate fossils. This is most important and valuable, as it is very extensive and contains a large number of type specimens, many of them unique and widely known from the description already published. In extinct mammals, birds and reptiles of North America this series stands pre-eminent. It was pronounced by Prof. Huxley to be surpassed by no other in the world, and as far back as 1878 Darwin expressed a strong desire to visit America for the purpose of seeing the collection. Since that time it has been more than doubled in size and value. The second collection is of fossil footprints, which form one of the most extensive and complete collections of the kind in the country, if not the most valuable. Third, the collection of the invertebrates, which is very large. Fourth, the collection of osteology. Fifth, the collection of American archæology and ethnology. Sixth, the collection of

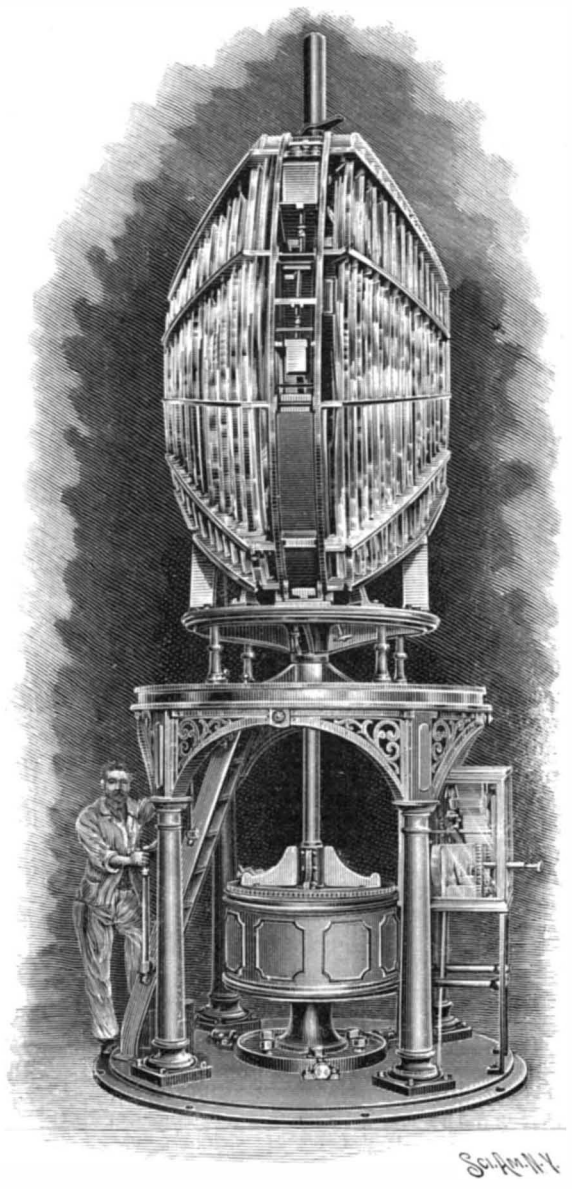


Fig. 2.—NINETY MILLION CANDLE POWER BIVALVE LENS FOR UNITED STATES LIGHTHOUSE SERVICE.

minerals. Besides the six main collections, several others of less value were also presented.

Prof. Marsh, in his letter, says that it has always been a part of his plan that these scientific collections should eventually become the property of Yale University. The deed of gift which he inclosed bears the date of January 1, 1898. The resolution of the corporation of Yale University gratefully acknowledged the magnificent gift which represents the unselfish devotion of the time, talents, energies and money of Prof. Marsh for more than thirty years.

To Seal Letters so That They Cannot Be Opened.

Steam or hot water will open envelopes closed with mucilage and even a wafer; a hot iron or a spirit lamp dissolves sealing wax, an impression in plaster having been taken of the seal. By the combined use of wafer and sealing wax, however, all attempts to open the letter otherwise than by force can be frustrated. All that is necessary is to close the letter first with a small well moistened wafer, and to pierce the latter with a coarse needle (the same applies to mucilage), whereupon sealing wax may be used over it in the usual manner. This seal can neither be opened by dry heat nor by moisture.

A NEW form of electric seismoscope is described by Dr. G. Agamennone in the last Bolletino of the Italian Seismological Society, the chief merits claimed for it by its inventor being its comparatively slight cost (about 30 f.) and its great sensitiveness. In most seismoscopes the movement of a pendulum is magnified by a long pointer, whose tip just passes through a hole in a metal plate, contact with which completes an electric circuit and starts a clock previously set at 12. In the new instrument the metal plate is not, as usual, fixed, but is connected with a second inverted pendulum, the bob of which is near the top of its supporting rod, while that of the first is near the base.

© 1898 SCIENTIFIC AMERICAN, INC.

A Curious Type of Swing Bridge.

The Neumunster-Rendsburg railway crosses the Kiel canal near Osterroenfeld, Germany, by two duplicate single-track swing bridges about 156 meters (512 feet) apart, and both operated by hydraulic power. Each bridge is a 70 degree deck structure with two unequal arms, one of 59·4 meters (195 feet) and one of 39·75 meters (130 feet), supported on a 9-meter (29½ feet) pivot pier, set close to one side of the waterway so as to give a clear opening of 50 meters (164 feet). The long arm has a rest pier 5 meters (16·4 feet) wide, which also receives the end of a 19·05 meter (62½ feet) approach girder from the shore abutment. The short arm has a very small rest pier near the end, which it overhangs 3·62 meters (12·8 feet), the extremity reaching beyond the pier to the other shore abutment. The short arm is loaded with a counterweight of 20 tons and its vertical surface is covered with corrugated iron sheathing to balance the wind pressure on the long arm. The principal peculiarity is the manner of operation: under railroad traffic the bridge is a continuous girder supported at the pivot and both rest piers, with the short projecting extremity of the short arm extended freely as a cantilever arm. To swing the bridge, the whole structure is raised by the vertical motion of the pivot support in such a manner that it first revolves as a whole in a vertical plane about the rest pier of the short arm as a center until the extremity of the cantilever end is sufficiently depressed to come in contact with the abutment, after which the further elevation of the pivot lifts the bridge from its former bearing on the rest pier of the short arm, so that it rests on the pivot and the extremity of the short arm, the latter being provided with wheels running on a short segment of turntable track. After being raised, the bridge is revolved 70 degrees to open it for navigation by means of a hydraulic ram operating a wire cable led around a horizontal arc on the pivot pier and anchored to its masonry. Each bridge has a separate power station, with two boilers carrying 90 pounds pressure and operating an engine which drives two pumps that develop a water pressure of 750 to 900 pounds, delivering into a 0·4 meter (15¾ inch) accumulator with 6 meter (19·68 feet) stroke. This apparatus will open and close the bridge in two minutes. The liquid used is composed of 100 parts of glycerine and 80 parts of water, and a pressure of 55 atmospheres (808 pounds per square inch) is sufficient to swing the bridge slowly against a wind pressure of 100 kilogrammes per square meter (20·48 pounds per square foot).—Railway and Engineering Review.

The Catacombs Lighted by Electricity.

The visitor to Italy complains of modern steam tugs on the Grand Canal in Venice, and the new fangled ideas of cleanliness in the streets of Naples and the new quarters in Rome, but the height of the prosaic seems to have been reached with the illumination of the catacombs by electric light. No more dim distances, in which one must take care not to be lost, no more monk guides, holding lighted tapers, no more darkness, mystery and imagination. This being the feast of St. Cecilia, says the Rome correspondent of The Pall Mall Gazette, the catacombs of St. Callixtus, where the Roman virgin was buried in 177 A. D., were for the first time all glowing and glaring with thousands of electric globes illuminating even the most remote corners, and giving to the whole a mundane rather than a mystic air.

These catacombs are outside the Porta San Sebastiano, on the magnificent Appian Way, that the Romans called the Queen Road, and near the world-renowned tombs of Cecilia Metella. St. Cecilia is not the only prominent martyr of the early Christian era whose name is connected with this burial place, for the remains lie there of several popes of the third century, as witness the original tombs of St. Antherus, St. Fabian, St. Lucius, St. Cornelius and St. Eutychianus, who all sat in the chair of St. Peter.

Thousands of Romans and foreigners have to-day visited this sacred spot. The crowd itself formed a picturesque view, as from below one looked up at the pilgrims descending and ascending the long, steep flight of stairs, or at the long procession of cowled monks and black-robed nuns, showing in vivid contrast to groups of students of the German College in their scarlet gowns, a garb that causes them to be called, in fun, the little cardinals. The corridors responded in echoes to their chants at the different altars, while there was a subdued hum from the less devout sightseer. What would be unperceived by the visitor, if he were not preinformed, is that the five miles of corridors and chapels are not on the same level, but form three different floors, one under the other. The most interesting spot is where St. Cecilia's tomb was found, and where also stands a copy of the statue of the saint designed by Maderno, representing her after her martyrdom. Next stands a most interesting marble tablet, the inscription on which was originally a pagan one dedicated to Marcus Aurelius. The Christians utilized the tablet by turning it and writing on the back a new epitaph to Pope St. Damasus.

Bones and skeletons of the ancient martyrs are found all along the walls, in three rows, one above the other. The lower room is the more disturbed, as almost every one tries to take something away as a sacred relic. But the electric light on these bones turns the catacombs into a museum.

The Business of the Patent Office.

The following summary of the business of the Patent Office during the past year will be of special interest to our readers. We draw particular attention to the remarkable increase in the number of applications over that of the previous year. In 1896 there were 49,774 applications, whereas this year the total has risen to 53,266. No stronger indorsement of the request of the Patent Office for larger appropriations could be found that is presented by these figures.

PATENT, TRADE MARK FEES, ETC.

Cash received	$1,224,291.00	
" refunded	5,834.00	
Net cash	1,218,457.00	
Certificates of deposit	33,540.00	
Total cash and certificates		$1,251,997.00

COPIES.

Cash received	$96,782.46	
" refunded	8,573.28	
Net cash	88,209.18	
Certificates of deposit	322.27	
Total cash and certificates		$88,531.45

RECORDING ASSIGNMENTS.

Cash received	$22,719.66	
" refunded	1,093.68	
Net cash	21,625.98	
Certificates of deposit	134.00	
Total cash and certificates		$21,759.98

SUBSCRIPTIONS TO OFFICIAL GAZETTE.

Cash received	$13,069.54	
" refunded	47.35	
Net cash	13,022.19	
Certificates of deposit	55.10	
Total cash and certificates		$13,077.29

REGISTRATION OF PRINTS AND LABELS.

Cash received	$546.00	
" refunded	270.00	
Net cash (total)		$276.00

AGGREGATES.

Cash received	$1,357,408.66	
" refunded	15,818.31	
Net cash	1,341,590.35	
Certificates of deposit	34,051.37	
Total cash and certificates		$1,375,641.72
Total receipts of the Patent Office for the year		$1,375,641 72

BALANCE IN TREASURY OF UNITED STATES TO CREDIT OF PATENT FUND.

Amount to credit January 1, 1897	$4,718,639.47
" of receipts in year 1897	1,375,641.72
Total	$6,094,281.19

From this deduct total expenditures, which are not known at present.

SUMMARY OF BUSINESS OF PATENT OFFICE IN PAST YEAR.

Number of applications for inventions	45,661	
" " " designs	2,150	
" " " reissues	94	
Total		47,905
Number of caveats filed	2,176	
Applications for regietration of trade marks	1,946	
" " " " labels	66	
" " " " prints	26	
Disclaimers filed	5	
Appeals on the merits	1,142	
Total		5,361
Total number of applications requiring investigation and action		53,266
Number of patents issued (including designs)	23,729	
" " reissued	65	
Total		23,794
Number of trade marks registered	1,671	
" " labels "	14	
" " prints "	16	
Total		1,701
Number of patents expired during the year	12,926	
" " withheld for non-payment of final fees	4,891	

Applications filed in 1896 were 42,077; designs, 1,828; reissues, 77; total, 43,982. Caveats, 2,271; trade marks, 2,005; labels, 59; prints, 36; disclaimers, 9; appeals, 1,412; total, 5,792. Total number for investigation and action, 49,774. Patents issued, including designs, 23,312; reissued, 61; total, 23,373. Trade marks registered, 1,813; labels registered, 1; prints, 32; total, 1,846. Patents expired, 12,133; patents withheld for nonpayment of final fees, 4,736.

It is noteworthy that not only is there an increase of the whole year's business over that of the previous year, but the last month of the year shows a considerable increase over its predecessors. The total number of applications for mechanical and design patents and reissues for December was 5,002, and in the last five days of the month the number of mechanical applications alone filed was as follows:

December 27	375 applications.
" 28	372 "
" 29	316 "
" 30	254 "
" 31	500 "

The last figure is, we believe, the largest single day's filing in this or any other country.

In this connection it is interesting to note that the number of applications filed last year in the British Patent Office was 30,938, or some 750 more than in 1896. These figures, however, are no indication of the number of patents granted; for, although during 1896 the number of applications was 30,194, some 17,000 were allowed to lapse, only 13,360 being completed before the nine months allowed between the filing of the provisional and complete specifications had elapsed.

The London Fire Inquiry.

As a result of the investigations which have been in progress for several weeks past into the great fire which occurred recently in the Cripplegate district of London, involving a loss of $3,750,000, the jury decided, on January 12, after five hours' deliberation, that "the fire was not caused by gas explosion or by spontaneous combustion, but was the work of some person or persons unknown." The foreman added that the jury was not satisfied that the Fire Brigade was fully equipped with steam fire engines and was not unanimous in the opinion that the water supply was efficient, and recommended that an engine with steam continually up be always kept at the Central City Fire Station.

London Engineering makes some remarks upon the Fire Brigade, which it is to be hoped will be taken to heart by the authorities that have charge of this force. This journal states, on authority of the report of the Hamburg experts, that there were 300 men actually at the fire and that 250 men available for outdoor work did not attend. It says: "A whole district was burned down while a quarter of the brigade was standing idle at their stations. To argue that these men were simply waiting in readiness to turn out to any minor fire is ridiculous, for to begin with there were no horses to carry them at their stations, even if the old manuals were taken. . . . A system which allows so many men to be doing nothing on an occasion like the Cripplegate fire surely must be very bad indeed; or, are we, perhaps, rightly informed that there is some custom in the brigade according to which the foremen do not care to overload their engines with too many men, as they think it might spoil their 'running' to the fire at a dashing gallop? . . . If we are rightly informed, the salvage corps actually went to the extent of calling up every available man in their force."

According to the report, to be short-handed is a mistake common to the London system. Speaking of the way in which the firemen were handled, the report referred to states that "the commissioners could not learn anything from the London Fire Brigade. How can a chief officer give the necessary directions when he has not the sufficient number of officers to keep him posted on what is going on? How can an attack be conducted when every steamer which arrives takes up any position which its foreman may think suitable, and is then got to work in what, for practical purposes, is comparatively slow time, owing to the small crew? How can we expect, with the few men at our disposal on each steamer, to run out long lengths of hose with the necessary rapidity to cut off a fire? It will, of course, be almost impossible to reorganize the London system of small stations with a few men into a system of large stations which can turn out in strong force; but whatever the system may be, it would be well to remember that one steam fire engine with a strong crew placed in the right position can do a great deal more work than three steamers taking up positions indiscriminately. We would only wish, in the interests of London, that the Metropolitan Fire Brigade should have at least a sufficient staff and use it; and, further, that the number of officers be increased."

The extracts given above are taken by Engineering from are port of a special commission of experts from Hamburg, who journeyed to London to inquire into the Cripplegate fire, and, of course, the report of these experts is entirely unbiased.

Engineering says: "Whatever may be said in the London County Council as to the fire protection in London, there is no doubt that we are far behind many other large centers; and though it is most unpleasant to be reminded of this by a foreign critic, we ought, perhaps, to be very thankful for the trouble which the commissioners have taken to explain our deficiencies to their authorities, with a view of avoiding similar mistakes in their own locality, and their letting us have the benefit of their research."

Mr. Fitz Gerald's Ascent of Mount Aconcagua.

Mr. Fitz Gerald, the leader of the expedition which, on April 11 last, ascended Mount Aconcagua, in the Andes, has just been interviewed in London. He describes the extreme difficulty and danger of the ascent. He had to struggle upward in deep masses of rotten, rocky material, in which the traveler slid back two feet out of every three he advanced. The party lived for two weeks in a small tent on the mountain side, at an altitude of 19,000 feet. The cold was intense and the wind blew a gale. Sometimes it took two hours to light a fire.

Mr. Fitz Gerald says that life at this altitude was extremely uncomfortable, the dust being very disagreeable, causing an exhausting cough. He said he was constantly sick, and the dust storms obliterated the whole sky. The mountain streams were poisoned, owing to some chemical that was dissolved in them from the surface, so that the water made all the party ill. Rain never falls on the mountain, and all the water had to be carried up. Of course, it froze on the way, and had to be thawed out when wanted. At times the view was splendid, the Pacific being stretched out before them, though the coast line is one hundred miles away.

© 1898 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Engineering.

CABLEWAY CARRIER AND CARRIAGE.—Carl E. Richson, Brooklyn, N. Y. This invention provides a suspension cableway, with means to support a hoisting rope and endless carriage rope, while providing devices to permit the carriage with its load to automatically switch past the hangers. A fixed rope or cable, stretched between towers or elevated points, carries hangers provided with means to engage a main cable forming a track for the carriage and pulleys to support the hoisting rope, there being means for switching the carriage past the hangers and returning the cable and the ropes to the hangers after the carriage has passed. The carriage is provided with tracks adapted to engage pulleys on the hanger to move the carriage and hanger transversely apart for the carriage to pass the hanger.

Mechanical.

CIRCULAR KNITTING MACHINE.—Willis A. Ingalls and Theodore S. Baron, Brooklyn, N. Y. To facilitate the production of ribbed knit fabrics having a backing of woolen yarns or silk threads interlaced with the body of the fabric and formed with floating, open loops adapted to be fleeced or napped, this invention provides for slidable hooks outside the vertical needles and operated by cams, for bringing an extra thread from the outside of the machine over the horizontal needles, back of the latches, and down between such needles, to interlace the thread with the fabric body, and form open loops on one surface of the body. With the attachment on the outside of the machine the work can be inspected at any time, and a broken thread rethreaded into the carrier or guide without difficulty and without interfering with the body of the fabric, broken needles being also readily removed and replaced.

MORTISING CHISEL.—William Potter, New York City. This chisel has a-chip-receiving channel, the inner faces of whose side walls are inclined upwardly in one plane and in opposite directions, and at their upper edges are turned toward each other to form flanges, the flanges being largest at the cutting or forward end of the tool. The chips have a free and ready passage from the cutting edge to the discharge point, being confined to the chisel for a certain distance from the cutting point, yet free to move rearward to the place of exit.

Bicycles, Etc.

BICYCLE ATTACHMENT.—Fred P. Hurst, Aurora, Oregon. To enable a bicycle to be run on a single rail of a railway track is the object of this invention, which provides the machine with two pairs of guides, respectively located at the front and rear. Rods clipped to the arms of the steering fork extend forward and down, and carry at their lower ends means for adjustably holding anti-friction rollers adapted to be brought to a bearing against opposite sides of the head of the rail, while at the rear of the wheel rods similarly clipped to the back stays also carry rollers likewise bearing against both sides of the rail, thus holding the wheel at the front and rear to run truly on the rail.

BICYCLE MATCH BOX.—Hilda Frank, New York City. The back of this box is curved to conform to the shape of the steering head or other part of the frame, on which the box is secured by a clip comprising side arms and a curved connecting bar. The spring-pressed cover of the box is made to overlap the casing to prevent entry of rain water, etc.

Agricultural.

STACKER FOR THRASHING MACHINES, ETC.—Axel Erickson, Winfield, and August Johnson, Roseland, Minn. The novel features of this invention are embodied in a conduit into which the material is drawn and through which it is forced by a fan at the base, the main section of the conduit being adapted to be raised and lowered, while to it is connected a mouth section which may be freely turned to control the direction in which the material is to be discharged.

Miscellaneous.

APPARATUS FOR RAISING LIQUIDS.—Ralph W. Elliott, Brentwood, Cal. According to this invention a reservoir adapted to contain compressed air is submerged in the liquid to be raised, the reservoir being connected with a compressed air supply by a pipe in which is a novel arrangement of valves, whereby the compressed air is admitted to the submerged reservoir for a period sufficient to expel and raise the liquid contained in the reservoir, the air then being discharged simultaneously with the opening of a valve in the reservoir to permit the latter to be again filled with the liquid. The whole operation is automatically effected by the pressure and exhaust of the air.

SEPARATING GAS AND OIL FROM WATER.—Manley W. Bovee, Goodwill Hill, Pa. To separate the gas and water from oil issuing from a well, before the oil reaches the tank, thereby saving the expense of small tanks and preventing evaporation in warm and slush in cold weather, as well as saving expense and labor, is the object of this invention. It comprises principally a chamber having outflow openings at top and bottom, the lower discharge being against a head a little less than that of the upper, while a supply pipe from the well projects axially into the chamber and has discharge jets at its inner end giving the mixed fluid a rotary motion, when the separation is effected by the difference in specific gravity of the gas and oil and the water.

ELEVATOR GUIDE LUBRICATOR.—Mathew Abt, New York City. To facilitate evenly spreading thick grease upon the front and sides of an elevator guide rail, this invention provides a device in the form of a receptacle to be held by a handle and having forwardly extending leg portions, admitting of front and side discharge openings, there being in the body portion a plunger, movable by a stem extending through the cover. The grease is applied by moving the device up and down the guide rail, with its bifurcate portions embracing the rail, and at the same time operating the plunger to eject the grease.

PRODUCING ENGRAVINGS.—Benjamin F. B. Fagg, Forestville, Wis. To facilitate the inexpensive production of matrices from photographs, drawings or other pictures, this invention provides for subjecting the pictures to a low temperature to produce frost, then dusting them with an adhesive substance and subjecting them to a higher temperature to cause the frost to melt and absorb the adhesive substance, causing the latter to adhere along the sides and ends of the lines of a picture, to form a matrix which may be used to form printing plates. To produce a thick frost on the sheet, it is moistened before being subjected to the freezing temperature.

PLASTIC COMPOSITION FROM CORK, ETC.—Maxime Hocquet, Paris, France. This invention provides for the production of novel compounds as substitutes for wood, paper, leather, felt, ceramic ware, etc., which can be made capable of resisting water, rigid or resilient or semiflexible, serving also as a non-conductor of heat or electrical insulator, and which can be turned in a lathe, carved or otherwise worked or moulded into shape. The cork, reduced to a more or less finely divided condition, is treated with a solution of borax and then dried, after which it is mixed with a solution of gelatine, Dutch glue, glycerine, crystallized sugar, ammonia and flowers of sulphur, tannin, etc., the various components being mixed and combined as described, according to the use to be made of the composition.

CYCLOIDAL CHARIOT.—Joseph W. Evans, Haskell, Texas. This invention provides a novel apparatus for affording amusement and diversion at seaside and other pleasure resorts, consisting of a truck mounted to roll on a fixed track and carrying a wheel with peripherally hung pivotal carriages, the wheel being geared with a moving part of the truck; so that as the truck moves along the track a rotary movement will be imparted to the wheel, and the passengers in the carriages will have a combined progressive and orbital movement. Within the structure of the wheel and supported by its axle is a horizontal platform on which persons may be seated without experiencing the orbital movement, this platform being especially adapted to accommodate an orchestra.

HAT SUPPORT FOR THEATER CHAIRS.—Harriette G. Cozzino, New York City. According to this invention, a cylindrical telescoping device is introduced in an opening in the back of the chair, the outwardly sliding member of which is provided with a frame in which is a mirror, while the frame is adapted to afford a support for the crown of a hat. When the support is not in use, the telescoping portion may be pushed in close to the back of the chair, when the device does not interfere with the passage of persons between the rows of seats.

GATE.—Otto Honegger, Fairmont, Minn. A gate which may be conveniently raised to clear an obstruction, and at the same time may be swung inward or outward as desired, is provided by this invention. Its strap hinges are attached to a vertical tube which passes through guides secured to a swing post, while a rod within and turning with the tube carries near its upper end a pulley. A rope or chain passes up from a central hinge and over this pulley to a drum secured centrally on the gate, the drum being provided with a ratchet wheel, and being turned by a crank, by means of which the gate may be raised and lowered.

JAR CLOSURE.—John Schies, Anderson, Ind. The cover of the jar, according to this invention, is made with a serpentine groove across its upper face, and a clamp of spring wire has a similar serpentine main or body portion to rest in the groove of the cover, the clamp having downwardly and inwardly inclined ends to engage the bead around the top of the neck of the jar. The form of the main portion of the clamp permits it to yield or expand longitudinally, facilitating its application to the jar, while also allowing for quite a range for the varying diameters of the mouths of jars.

WASHING MACHINE.—Herman G. Weilage, Crete, Neb. In this machine a grate is mounted to rock in standards, there being a pivotally mounted compressing table above the grate and locking devices carried by the table for engagement with the standards. The clothes are cleaned without rubbing them upon a board or together, but by using compressed air to force the washing fluid through them, thereby preventing the breaking off of buttons and damaging of fine fabrics, the pieces placed in the machine occupying a space between the compressing table and the rocking grate. A tub or tank of any form may be used, the bifurcated standards being secured to its opposite sides.

EMBROIDERY FRAME.—Norris C. Leonard, McMinnville, Tenn. This frame comprises two open hoops, their ends lapping on each other, and each hoop having a series of apertures for the reception of pins at the ends of the hoops, the pins pointing in opposite directions, while clamps prevent their leaving the apertures. The hoops of the frame may be quickly and conveniently adjusted, not only to different sizes of material, but also to different thicknesses, thus doing away with the necessity of having different hoops for each size of material to be worked on.

Designs.

COMB.—John T. Wilcox, Leominster, Mass. The teeth of this comb are arranged in two groups, one at each end, and those in one group are curved oppositely to those of the other group, the teeth also having a wavelike form.

BICYCLE CARRIER.—Robert G. Woodward, Alameda, Cal. This device comprises a bracket adapted for ready attachment to the frame and carrying two forwardly and upwardly projecting hooks.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

For mining engines. J. S. Mundy, Newark, N. J

"U. S." Metal Polish. Indianapolis. Samples free.

Gasoline Brazing Forge, Turner Brass Works, Chicago

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Power Hammers manuf'd by Jenkins & Lingle, Bellefonte, Pa.

Improved Bicycle Machinery of every description. The Garvin Machine Co., Spring and Varick Sts., N. Y.

Concrete Houses — cheaper than brick, superior to stone. "Ransome," 757 Monadnock Block, Chicago.

Manufacturers contemplating advertising should always write to M'f'rs Adv. Bureau, New York, for rates.

Machinery manufacturers, attention! Concrete and mortar mixing mills. Exclusive rights for sale. "Ransome," 757 Monadnock Block, Chicago.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7326) F. & B. ask: Where can we obtain directions for enameling photographs? We do not mean the ordinary method of squeegeeing onto a ferrotype plate, but the method where a hot solution is poured over the photo. A. Use very clean plates and rather larger than the prints to be enameled. Wipe them well, rub them with talc, and remove the excess with a soft brush passed lightly over the surface. In a dish, half filled with ordinary water, immerse the photographs and allow them to soak. This being done, coat one of the talcked plates with enameling collodion in the ordinary way, agitate to cause the ether to evaporate, and when the film has set—that is to say, in a few seconds—steep this plate, the collodionized surface up, in a second dish containing pure water. Now take one of the prints in the first dish and apply the printed side to the collodion, remove the plate from the dish, keeping the print in its place with the finger of the left hand, and remove the air bubbles by lightly rubbing the back of the photograph with the forefinger of the right hand. Care has been taken beforehand to prepare some very pure starch paste, passed through a cloth, and some thin cardboards, or simply thick paper, the size of the plates used. The air bubbles having completely disappeared, and the perfect adherence of the print ascertained, dry with bibulous paper, and spread over the prepared cardboard or paper a coating of the collodion by means of a flat brush. Apply this sheet on the print, pass the finger over it to obtain complete adherence, and give it twenty-four hours to dry. At the expiration of this time, cut with a penknife the cardboard or paper even with the print, and detach by one corner. If the plate has been well cleaned, the print will come off itself. We get in this manner a very brilliant surface and as solid as that obtained by the use of gelatine, which, as it is seen, is entirely done away with in this process. The prints are afterward mounted on thick cardboard in the usual way. It is possible, by mixing with the collodion some methyl blue dissolved in alcohol (a few drops are sufficient), to obtain moonlight effects, especially if a rather strong negative has been used. For sunsets, make use of an alcoholic solution of coccinine.

(7327) G. F. H. asks for the receipt for a good sarsaparilla.

A.	Fluid extract of sarsaparilla	3 oz
	Fluid extract stillingia	3 "
	Fluid extract yellow dock	2 "
	Fluid extract May apple	2 "
	Sugar	1 "
	Potassium iodide	90 grn.
	Iron iodide	10 "

Mix them.

(7328) A. K. D. asks: 1. Would it be safe in changing the type of dynamo described in SUPPLEMENT, No. 600, if care is taken to get about the same bulk of iron in the fields, must the winding have that length and thickness, or would it matter if the legs were a little shorter and thicker, just so as to get on the amount of wire? A. The field magnets of eight light dynamo may be shortened if care is taken to preserve the same area of cross section and same number of turns of wire in field and armature coils. It will require more wire on the spools, since there will be fewer turns in a larger magnet. 2. Would a 10 or 12 foot windmill do to run a ten or twelve light dynamo satisfactorily? A. You will require about 1 horse power to drive the dynamo. A 12 foot windmill will give this when the wind blows 20 miles per hour. 3. Would it be safe to put a power mill on a barn, especially if the shaft is run down inside between the hay and wall (of course a box around it), dynamo outside? What I mean is as regards lightning. A. If proper lightning rods are put up, you will probably be able to insure your buildings with the windmill on them.

(7329) W. J. K. asks: 1. What is meant by "boiled out" linseed oil such as Tesla used for insulating his "high frequency" coils? Does it mean common boiled linseed oil such as used for painting? A. We do not know what "boiled out" linseed oil is, unless it may be boiled oil. 2. What inch spark would be obtained from the Tesla disruptive coil described in "Ruhmkorff Induction Coils," chapter xii, by H. S. Norrie, if the primary is run by a static machine giving a 2-inch spark? A. The voltage is raised by such a coil in the ratio of the number of turns in the primary to those of the secondary, approximately. We can give no exact answer in inches of spark, since the spark length does not correspond to the voltage as measured by a voltmeter, but upon the highest voltage attained at the instant when the surgings of the discharge are greatest, and this cannot be measured. 3. Is that plan of a coil a good one? A. Yes. 4. Could the spark obtained be used for X ray tubes? A. Yes, if the original voltage is strong enough to be transformed. The machine should give a torrent of 2-inch sparks to start with.

(7330) H. F. and others write concerning formula 3 of query 7299, issue of January 8, asking if it is correct. The amounts of chloride of gold and nitrate of lead should be expressed in grains, not ounces.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

JANUARY 18, 1898,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Accouchement chair, safety, S. Swain 597,473
Alarm. See Burglar alarm.
Axle skein, wagon, J. Sandage 597,692
Baling press, W. T. Younger 597,478
Basket and table, combined lunch, A. Williams 597,662
Bearing, ball, G. M. Tinker 597,444
Bearing, journal, J. Oldendorph 597,429
Bed and chair, convertible folding, J. B. Fellows 597,480
Bed frame construction, O. S. Foster 597,673
Bedstead and mantel, combination, L. W. Rhoads 597,591
Beheading device, F. E. Goldsmith 597,408
Bicycle, F. W. Smith 597,441
Bicycle attachment, Peate & Koosch 597,527
Bicycle brake, C. Eickemeyer 597,403
Bicycle brake, pneumatic, L. Bowles 597,456
Bicycle, chainless, W. H. Russell 597,621
Bicycle holder, G. T. McIntosh 597,507
Bicycle motor, air, Hansard & Hiatt 597,466
Bicycle motor, pneumatic, E. A. Cozens 597,394
Bicycle mud guard, W. G. Nutsford 597,471
Bicycle seat, A. E. Hardy 597,674
Bicycle stall, E. S. Piper 597,510
Bicycle wheel, J. Probst 597,431
Board. See Bulletin board.
Boat, E. Verburg 597,595
Boiler. See Hot water and steam boiler.
Boiler, C. C. Hansen 597,498
Boiler flue cleaner, L. Krueger 597,421
Boiler tubes, device for removing scale from, E. F. Gwynn 597,409
Bolting machine, J. G. Hintz, Jr 597,412
Boot or shoe, Molloy & Kirchner 597,524
Bottle, non-refillable, R. F. Tattersall 597,474
Box. See Letter box.
Box former, J. C. Titus 597,624
Brake. See Bicycle brake. Car brake.
Brake for bicycles, etc., F. Ecaubert 597,533
Brick repressing machine, Richardson & Holl 597,634
Bridge, A. G. Pratt 597,590
Brush, hat, A. Mauser 597,425
Brush, rotary, J. Frossard 597,521
Buckle, back band, Judd & McManus 597,501
Bulletin board, G. Percy 597,685
Burglar alarm, J. C. De Witt 597,573
Burner. See Gas burner. Lamp burner.
Caisson, floating, J. F. Webb 597,597
Can. See Fruit shipping can.
Can covers, machine for lining metal, J. Brenzinger 597,386
Car brake, electric, C. F. De Redon 597,432
Car brake, electromagnetic railway, C. F. De Redon 597,433
Car coupling, C. Dutchburn 597,575
Car coupling, M. B. Giberson 597,462
Car coupling, J. Linden 597,615
Car coupling J. T. Wilson 597,699
Car, side entrance convertible street, L. T. Pyott 597,512
Car signal and indicator, Travaglini & Teti 597,490
Car, trolley, J. D. Hull 597,467
Car wheel, J. W. Fuller 597,540
Carbon assorting machine, H. S. Hart 597,646
Carpet fastener, W. Sonneborn 597,514
Case. See show case.
Cash register, A. Latham 597,504, 597,505
Cash register and indicator, Hess & Stoughton 597,676
Cattle guard, R. H. Hodges 597,414
Chair. See Accouchement chair. Convertible chair. Invalid's chair.
Chair, A. Andren 597,665
Check spring, F. B. Walker 597,596
Chuck, J. A. Howarth 597,558
Cigar cutting and stamping machine, B. Sheldon 597,593
Circuit breaker, F. C. Robertson 597,700
Clam shell scoop or digging apparatus, J. H. Lancaster 597,422
Clamp. See Corset clamp. Hose clamp.
Clasp. See Corset clasp.
Cleaner. See Boiler flue cleaner.
Closet operating device, siphon jet, P. Harvey 597,499
Clothes line support, C. Abromeit 597,534
Clutch, friction, F. P. Canfield 597,479
Clutch, friction, W. S. Rogers 597,434
Coal from slate, machine for separating, Evans & Mathewson 597,404
Coffee or tea pot, D. H. Talbert 597,485
Coffee roaster, E. Detwiler 597,397
Coffin handle brace, A. A. Dekin 597,494
Commode, A. M. Bell 597,381
Convertible chair, J. Kluenter 597,581
Cooking utensil, A. L. Bliss 597,535
Corset clamp, P. J. Menahan 597,685
Corset clasp, W. W. Lasker 597,584
Coupling. See Car coupling. Rope coupling.
Crate, J. F. East 597,678
Cuff fastener, C. G. King 597,679
Curtain, E. H. Duchemin 597,402
Curtain fastener, J. F. Powell 597,511
Curtain rod sash, G. H. Atkins 597,551
Dental cuspidor, G. Booth 597,384
Dental plugger, F. L. Marshall 597,469
Display rack, W. F. Scott 597,590
Door check, J. T. Mumford 597,425
Door raising or lowering device, cellar, F. J. Clinkinbeard 597,457
Dress supporter, M. J. McLeod 597,428
Drier. See Lumber drier.
Drill. See Mining drill.

(Continued on page 78)

© 1898 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

WOOD or METAL WORKERS
without steam power can save *time* and *money* by using our
Foot and Hand Power Machinery
SEND FOR CATALOGUES—
A—Wood-working Machinery.
B—Lathes, etc.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE
SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

Boys! Men! "Strike while the Iron's Hot." Complete and Thorough Instruction **By Mail**
ADVANCE YOURSELVES.
IMPROVE YOUR CONDITION.
THE HOME SCHOOLS OF
Mechanical, Electrical, Steam, Civil, and Sanitary Engineering, Architecture, Metal Working, Pattern Making.
To encourage you to start **now**, we furnish $11 mechanical drawing outfit **free.** Small Fees. Advance or *Installments.* Send for beautifully illus. 100 page S. A. catal., postpaid.
United Correspondence Schools,
154 to 158 5th Ave., New York, N. Y.
F. W. EWALD, Gen. Mgr.

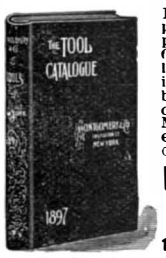
Pipefitters!
Your kit is not complete unless it includes the famous
STILLSON WRENCH
which is particularly adapted for turning out the best work *without crushing the pipe* in the least. All parts are drop-forged. Once tried, it is always used. It has many imitations but no equals. See explanatory cuts. Price list on application to
WALWORTH MFG. CO., 20 Oliver Street, Boston, Mass.

The Finest of Work

can be turned out by the best of tools
THE RIVETT LATHE
With slotting attachment. By its aid the smallest wheel may be key-seated in from 40 seconds to 2 minutes. Greatest and best lathe in the world.
FANEUIL WATCH TOOL CO., Boston, Mass., U. S. A.

SUB-PRESS PUNCHES AND DIES
We make to order to drawings or models blanking, shaving and swaging dies, either simple or compound, for work requiring accuracy and finish. Sub-Press Dies for the parts of watches, clocks, cyclometers, and other small mechanisms a specialty. We carry in stock different sizes of Sub-Press Bases and Stands. *Send for Descriptive Circ'r.*
THE PRATT & WHITNEY CO.
Hartford, Conn., U. S. A.

"It Tells About Tools"



Every Mechanic, Metal Worker, or person interested in Machinery Supplies should have our new 1897 Tool Catalogue. It contains 710 pages, size 10½x7½, and is an exhaustive and instructive list of all tools that may be required. Handsomely bound in cloth, express paid on receipt of $1. Money paid for book will be refunded with first order amounting to $10 or over. *Send stamps or money order.*
MONTGOMERY & CO.
MAKERS AND JOBBERS IN
FINE TOOLS,
105 Fulton Street, New York City.

The Queen Acme No. 5 Microscope
NEW MODEL AS PER CUT.

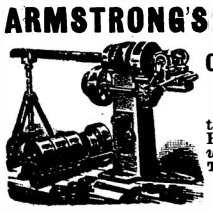
The Ideal Microscope for Amateur Research. Stands unequaled for precise and accurate adjustments and optical excellence. With objectives giving from 50 to 500 diameters, in case, **$15.00.**
Send for new Microscope Catalogue B. M.
QUEEN & CO., INC.
1011 Chestnut St., Philadelphia, Pa.

TRANSITS AND LEVELING INSTRUMENTS.
NICKEL PLATED **ELECTRIC LEVELS**

Sizes, 2 and 3 inches. Prices, 25 and 30 cents.
For Book on the Level. P. O. Box 977, **C. F. RICHARDSON & SON, Athol, Mass., U. S. A.**

CROOKES TUBES AND ROENTGEN'S Photography.—The new photography as performed by the use of Crookes tubes as a source of excitation. All about Crookes tubes. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **181, 189, 238, 243, 244, 792, 795, 905, 980, 1050, 1054, 1055, 1056, 1057,** also SCIENTIFIC AMERICAN, Nos. **7, 8, 10** and **14,** Vol. 74. These profusely illustrated SUPPLEMENTS contain a most exhaustive series of articles on Crookes tubes and the experiments performed with them. Among them will be found Prof. Crookes' early lectures, detailing very fully the experiments which so excited the world and which are now again exciting attention in connection with Roentgen's photography. Price 10 cents each. To be had at this office and from all newsdealers.

ARMSTRONG'S PIPE THREADING
—AND—
CUTTING-OFF MACHINES



Both Hand and Power.
Sizes 1 to 6 inches.
Water, Gas, and Steam Fitters' Tools, Hinged Pipe Vises. Pipe Cutters. *Stocks and Dies universally acknowledged to be* THE BEST. ☞ *Send for catalog.*
THE ARMSTRONG MFG. CO.
Bridgeport, Conn.

Dynamometer, transmission, S. W. Robinson..... 597,567
Egg case filler, McLane & Hardgrave..... 597,525
Electric furnace, T. L. Willson..... 597,476
Electric machinery, regulation of dynamo, F. A. Johnson..... 597,418, 597,419
Electric switch, E. M. French..... 597,642
Elevator regulator, P. Gately..... 597,406
Engine. See Gasoline engine. Rotary engine.
Envelopes, machine for applying adhesive material to, C. N. Bintcliffe..... 597,453
Excavator, M. C. Guy..... 597,578
Extension table, M. E. Johnston..... 597,500
Fabric. See Woven fabric.
Fare recorder, J. F. Ohmer..... 597,560
Fare register, Ohmer & Tyler..... 597,561
Faucet, P. Boutilier..... 597,631
Feed mechanism, F. H. Richards..... 597,565
Fence, E. M. Kopka..... 597,583
Fence, C. Marsch..... 597,684
Fence machine, wire, G. B. St. John..... 597,442
Filter, waterworks, R. Kurka..... 597,680
Filtering material and making same, F. Jurschina 597,678
Flooring jack, D. Dutt..... 597,671
Folding table or seat, J. B. Corser..... 597,604
Framing tool, L. Girton..... 597,464
Fruit picker, R. L. Savage..... 597,659
Fruit shipping case, D. S. Carpenter..... 597,391
Furnace. See Electric furnace. Ore roasting furnace. Smelting furnace.
Garment, A. H. Devoe..... 597,398
Gas burner, A. Anzelewitz..... 597,600
Gas heater, acetylene, E. J. Dolan..... 597,495
Gas meter, J. Tourtel..... 597,484
Gasoline engine, W. R. Bullis..... 597,389
Gate, L. W. Orton..... 597,653
Gate, D. Wilson..... 597,449
Gold separator, J. M Wishart..... 597,450
Grain separator timothy cleaning attachment, E. G. Clymans..... 597,459
Grappling device, J. E. Davison..... 597,668
Greenhouse shade, Paul & Kirkwood..... 597,562
Guncotton, making, C. Quinan..... 597,565
Handkerchief holder, lady's, C. C. Davis..... 597,636
Handle. See Tool handle.
Harvester, corn, A. D. Osgood..... 597,545
Harvester, grain, R. W. Coombs..... 597,635
Harvester or mower cutting mechanism, S. Douglass..... 597,400
Hat rack, Groth & Rother..... 597,522
Hay rake, J. Goppert..... 597,446
Hay stacker or ricker, J. J. Neff..... 597,586
Heater. See Gas heater. Steam heater.
Hinge, adjustable gate, J. R. Blankenship..... 597,383
Hobby horse, J. Johnck..... 597,702
Hook. See Pipe hook.
Hoops and securing ends thereof, machine for sizing barrel, C. O. White..... 597,701
Hoops for rims, etc., machine for bending, R. A. Gibson..... 597,463
Horseshoe pad, J. Stanley..... 597,549
Hose clamp, G. E. Thomas..... 597,443
Hose nozzle attachment, E. D. Kellerman..... 597,648
Hot water and steam boiler, E. S. Manny..... 597,683
Huller. See Pea huller.
Indicator. See Well indicator.
Insect exterminator, S. E. Peebles..... 597,509
Invalid's chair, J. G. Yznaga..... 597,598
Ironing machine, I. Harris..... 597,410
Ironing table, C. R. Sarvis..... 597,528
Jack. See Flooring jack.
Jar closure, W. B. McCrosky..... 597,687
Journal box, L. H. Nash..... 597,616
Key fastener, L. H. Redfield..... 597,547
Keyhole guard, H. Christenson..... 597,634
Knife washing device, F. Hayes..... 597,411
Knitting machine needle, W. T. Rowlett..... 597,488
Labeling machine, D. D. Weisell..... 597,570
Lamp, bicycle, J. W. Bragger..... 597,385
Lamp burner, P. Lucas..... 597,682
Lamp, electric arc, E. Blaser..... 597,601
Lamp, electric arc, A. Mougin..... 597,424
Lamp filament, incandescent, F. E. W. Bowen..... 597,492
Lamp or burner, incandescent, D. J. Prendergast 597,430
Lamp, street, D. J. Prendergast..... 597,546
Lamp, street, Shaw & Lees..... 597,439
Lamp, street, V. H. Slinack..... 597,548
Laundry apparatus, J. D. Budd..... 597,662
Leg, artificial, M. E. Hagen..... 597,465
Letter box, R. W. Kelly..... 597,420
Lock. See Safe lock. Seal lock.
Lock, F. H. Blake..... 597,382
Lock, J. M. Brown..... 597,387
Lock, J. J. Dillenbeck..... 597,669
Lubricator, C. Geier..... 597,577
Lubricator, W. F. Van Guysling..... 597,698
Lumber dryer, H. J. Morton..... 597,543
Machine holder or locking device, C. P. Neubert.. 597,526
Marble slabs, device for securing fixtures to, J. H. Lanahan..... 597,503
Marshmallow runner, R. W. Douglas..... 597,637
Match igniting device, T. F. Williams..... 597,448
Mattress stuffing machine, W. Tucker..... 597,446
Meter. See Gas meter.
Milk for infants, preparing cows', A. Backhaus... 597,378
Milling machine, L. D. Burlingame..... 597,390
Mining drill and channel cutter, J. P. Paynter.... 597,589
Mordanting wool, C. Dreher..... 597,401
Motion reversing device, W. S. Rogers..... 597,435
Motor. See Bicycle motor. Spring motor.
Mowing machine grain lifter, W. Jager..... 597,580
Nipple holder and support therefor, A. M. Shurtleff..... 597,513
Nut lock, C. Eberhart..... 597,638
Oar, bow facing, A. C. Dice..... 597,399
Ore concentrator, C. J. Paine..... 597,617
Ore roasting furnace, H. Wehrum..... 597,628, 597,629
Overlay, Humphrey & Upham..... 597,677
Ozone or ozonized air, apparatus for producing, A. Verley..... 597,517
Package, H. A. De Kay..... 597,395
Pad. See Horseshoe pad.
Paper enameling apparatus, Fitz George & Brown 597,405
Paper folding machine, C. S. Evans..... 597,461
Parer, corer and divider, apple, W. B. Lloyd..... 597,487
Pea huller, H. G. Francis..... 597,609
Pencil sharpener, W. F. Garrett..... 597,643
Perfumery, apparatus for making, J. Lahmer.... 597,502
Picker. See Fruit picker. Stone picker.
Picture frame support, J. T. Mumford..... 597,426
Pile fabrics, apparatus for cutting the pile of weft, G. Roger..... 597,619, 597,620
Pile fabrics, mechanism for cutting the pile of weft, G. Roger..... 597,658
Pillow sham holder, H. Hutchins..... 597,417
Pipe hook, C. F. Schilling..... 597,438
Pipes, detachable coupling for lead, P. H. Gundermann..... 597,497
Piperazin salts, making, W. B. & A. Bishop..... 597,454
Pistol, magazine, A. Nygren..... 597,588
Plane, J. N. Schneider..... 597,622
Planter, W. L. Beall..... 597,485
Planter attachment, W. H. Gongwer..... 597,644
Planter, corn, J. Zakovec..... 597,599
Planter runner, seed, H. F. Deterding..... 597,396
Plow, J. W. Viles..... 597,626
Pocketbook, F. Hasselberger..... 597,579
Polishing curved surfaces, device for, H. T. Winters..... 597,518
Polishing machine, E. P. Lorch..... 597,542
Post depositing and collecting receptacle, etc., D. Di B. Savorgnan..... 597,437
Pot. See Coffee or tea pot. Tea or coffee pot.
Power. See Wave power.
Press. See Baling press. Printing press.
Printing press, J. F. McNutt..... 597,651, 597,652
Propeller, screw, A. H. Carpenter..... 597,632
Prune dipper, F. C. Chapman..... 597,633
Pruning implement, F. H. Duesler..... 597,538
Pulley, E. Shmitz..... 597,531
Pump, cattle, C. V. Eggleston..... 597,639
Pump, measuring, M. J. Wine..... 597,477
Punch, check, M. Hirsh..... 597,413
Rack. See Display rack. Hat rack.
Railway conduit, electric, C. V. Osborn..... 597,508
Railway, highway, H. L. Stillman..... 597,515
Railway signaling, electric lock and system of electric locking for securing additional safety in, Morris & Mumford..... 597,650
Railway switch, portable, W. Barton..... 597,380
Raising floating objects, means for, L. Dodge.... 597,606
Rake. See Hay rake.
Recorder. See Fare recorder.
Refrigerating apparatus, W. F. Singer..... 597,532
Refrigerator, J. D. Colony..... 597,393
Register. See Cash register. Fare register.
Register, W. G. Shaw..... 597,695
Registry of associated sheets, means for securing, W. Spalckhaver..... 597,695
Regulator. See Elevator regulator. Teeth regulator.
Rheostat, M. Norden..... 597,470
Roaster. See Coffee roaster.
Rope coupling, transmission, G. C. Henning..... 597,675
Rotary engine, H. J. McLoed..... 597,585
Rowing gear, L. A. Cook..... 597,603
Saddle, harness, Hudson & Meier..... 597,523
Safe lock, G. J. Gesswein..... 597,407
Sash fastener, A. C. Wilcox..... 597,475
Scale, Fairbanks & Sargent..... 597,641
Scale, computing, J. E. Duncan..... 597,607
Scale, price, T. J. Dunlea..... 597,670
Scale, weighing, F. W. Taylor..... 597,697
Scales, printing register for weighing, H. Fairbanks..... 597,640
Scales, ticket and ribbon holder for recording, H. Paddock..... 597,654

(*Continued on page 79*)

WILLIAMS' SHAVING SOAPS THE ONLY REAL SHAVING SOAPS
INCOMPARABLE FOR THEIR RICH CREAMY **LATHER.**
NO OTHERS SO SOOTHING HEALING LUXURIOUS.

WILLIAMS' SOAPS are for sale everywhere, but if your dealer does not supply you, we mail them—to any address—postpaid on receipt of price.

Williams' Shaving Stick, 25 cts.
Genuine Yankee Shaving Soap, 10 cts.
Luxury Shaving Tablet, 25 cts.
Swiss Violet Shaving Cream, 50 cts.
Jersey Cream (Toilet) Soap, 15 cts.
Williams' Shaving Soap (Barbers'), Six Round Cakes, 1 lb., 40c. Exquisite also for toilet. Trial cake for 2c. stamp

THE **J. B. WILLIAMS CO.**
Glastonbury, Conn., U.S.A.
LONDON, 64 Gt. Russel St.
SYDNEY, 161 Clarence St.

SUSPENDER BUTTONS . . .

often pull off. It does not matter if you have a **Bachelor's Button** in your pocket. Slips on or off in a jiffy and holds like grim death, without tearing the fabric. By mail for 10 cents. Illustrated booklet describing hose and drawer holders and other novelties using the **Improved Washburne Pat. Fasteners,** sent for the asking
American Ring Co., Box P, **Waterbury, Conn.**

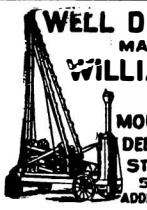
PERPETUAL MOTION
A valuable series of papers giving all the classic forms of perpetual motion apparatus. The literature on this subject is so very limited, the only book being entirely out of print, so that this series will be important to all inventors. 30 illustrations. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1130, 1131, 1133, 1135, 1136, 1137, 1138.** Price, 10 cents each. For sale by Munn & Co. and all newsdealers. Send for new catalogue.

HAND DYNAMO $2.75.

Price with Incandescent Lamp attached, **$3.50.** For schools, young experimenters, etc. Weight 7 lbs. Will run two 1-candle power lamps. Can be used as a Medical Battery in cure of Rheumatism, Neuralgia, Numbness, etc. A practical machine, not a toy. Rings Bells on Telephone Circuit 3 miles long. No danger. A child can handle it. Book telling "How to make a ¼-horse-power Dynamo or Motor," **10c.** *Catalogue Free.* **BUBIER PUB. CO., Lynn, Mass., Box B.**

Eyelet Machines.
We can furnish the Latest Improved Eyelet Machines for making shoe eyelets and special eyelets of all descriptions. We are also builders and designers of Special Wireworking Machinery.
☞ *Send for Circular.*
BLAKE & JOHNSON,
P. O. Box 7, WATERBURY, CONN., U. S. A.

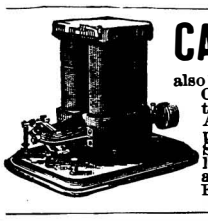
WELL DRILLING MACHINERY,
MANUFACTURED BY
WILLIAMS BROTHERS,
ITHACA, N.Y.
MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER
SEND FOR CATALOGUE
ADDRESS WILLIAMS BROS. ITHACA, N.Y.



THE MODERN ICE YACHT.—BY GEO. W. Polk. A new and valuable paper, containing full, practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of the latest, most approved forms. Illustrated with engravings drawn to scale, showing the form, position, and arrangement of all the parts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **624.** Price 10 cents. To be had at this office and of all newsdealers.

THE HARRINGTON & KING PERFORATING Co
PERFORATED ZINC FOR CLEANING OF GRAIN &C
ANY SIZE & SHAPE OF HOLE
PERFORATED SHEET-METALS FOR ALL PURPOSES
225 NORTH-UNION ST. CHICAGO ILL. U.S.A.

ACETYLENE GAS AND CARBIDE OF Calcium.—All about the new illuminant, its qualities, chemistry, pressure of liquefaction, its probable future, experiments performed with it. A most valuable series of articles, giving in complete form the particulars of this subject. Apparatus for making the gas. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **998, 1004, 1007, 1012, 1014, 1015, 1016, 1022, 1035** and **1038.** The most recent apparatus of simple and more elaborate type described and illustrated in special acetylene Supplement No. **1057.** Price 10 cents each. To be had at this office and from all newsdealers.



CASTINGS and all Material for building 8 Lt. Dynamo also 10 Lt. of late, attractive design. Castings and Parts for all Motors described in SCIENTIFIC AMERICAN Supplements. Telephones and Electrical Supplies. Send stamp for fine new catalogue. This ad will not appear again. THE JOHN REEK ELECT'L WKS. Camden, Mich.

Buy Telephones

THAT ARE GOOD--NOT "CHEAP THINGS."
The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are **both good.**
WESTERN TELEPHONE CONSTRUCTION CO.
250-254 South Clinton St., Chicago.
Largest Manufacturers of Telephones exclusively in the United States.

A. W. FABER
Manufactory Established 1761.
LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.
78 Reade Street, - - - New York, N. Y.
Manufactory Established 1761.

IT'S ALL IN THE GRIP
Every housewife is sure to want the
HOLD-FAST CLOTHES LINE HANGER

as soon as she sees it. Simple, sure and strong. The tighter the strain, the more secure it is. Easily adjusted anywhere. Suited for either rope or wire. Fixed in a second. **Not sold in stores.** *Agents wanted.* 25 cents for sample pair, by mail; $1.50 one dozen pairs, prepaid.
☞ Discount for ten dozen or over.
KELSO NOVELTY CO., 526 Locust St., PHILA., PA.

DORMAN'S VULCANIZERS
are used all over the world.

Exclusive Manufacturers of Steam Machines for Rubber Stamps. We also make Dry Heat Vulcanizers. Complete outfits from $10 to $1,000. All Stamp and Stencil Tools and Supplies. Brass and Steel Dies for all purposes. Seals, Engraving and Die Sinking of all kinds. Established 1860. Printing Presses, with complete outfits, from $1 to $100. ☞ *Send for Catalogues.*
THE J. F. W. DORMAN CO.
121 E. Fayette St., Baltimore, Md., U. S. A.

The Scientific American

PUBLICATIONS FOR 1898.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

Scientific American (weekly), one year, - - $3.00
Scientific American Supplement (weekly), one year, 5.00
Export Edition of the Scientific American (monthly) in Spanish and English, - - - - - 3.00
Building Edition of the Scientific American (monthly), - - - - - - - - - - 2.50

COMBINED RATES
in the United States, Canada, and Mexico.

Scientific American and Supplement, - - - 7.00
Scientific American and Building Edition, - - 5.00
Scientific American, the Supplement, and Building Edition, - - - - - - - - - - 9.00

TERMS TO FOREIGN COUNTRIES.

The yearly subscription prices of Scientific American publications to **foreign countries** are as follows:

	U. S. Money.	English Money. £ s. d.
Scientific American (weekly), - - -	$4.00	0 16 5
Scientific American Supplement (weekly)	6.00	1 4 8
Building Edition of the Scientific American (monthly), - - - - -	3.00	0 12 4
Export Edition of the Scientific American (monthly) in Spanish and English	3.00	0 12 4

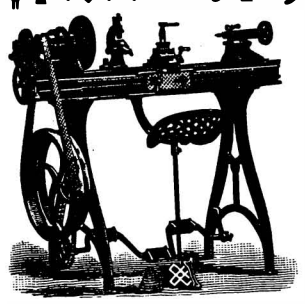
COMBINED RATES TO FOREIGN COUNTRIES.

Scientific American and Supplement, -	8.50	1 14 11
Scientific American and Building Edition, - - - - - - - - -	6.50	1 6 9
Scientific American, Scientific American Supplement, and Building Edition, -	11.00	2 5 2

☞ *Proportionate Rates for Six Months.*

The above rates include postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.

$70.00 A Foot-Power Lathe $70.00
and Outfit of Tools



No. 4½ SCREW CUTTING LATHE.
9" swing, 25" between centers.

SPECIAL OFFER!
List price of the No. 4½ Lathe is $65.00. We will furnish the Lathe with Set of Slide Rest Tools, Three Lathe Dogs, Five-inch Chuck with Two Sets of Jaws, Lathe Arbor, and Set of Morse Twist Drills, 1-16 x ½ x 32ds, in all amounting to $85.00 for $70.00. Goods carefully packed and on board cars at Rockford.
☞ *Send for Descriptive Catalogue.*
W. F. & JOHN BARNES CO.
999 RUBY STREET, ROCKFORD, ILL.

© 1898 SCIENTIFIC AMERICAN, INC.